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Place Your Order for an Index

As stated in these columns last month, considerations of conservation and economy preclude the issuance of a copy of the annual index with every copy of the December issue. Based on previous experience, enough copies of the 1920 index have been printed for all who will want them. Indexes will be sent to all who send in requests. Applications should be addressed to the *Railway Maintenance Engineer*, 608 South Dearborn street, Chicago.

The Master Painters' Association

On another page of this issue we present a report of the recent convention of the smallest of the maintenance associations—that of the master painters. Supervisors of bridges and buildings will find it profitable to read this report carefully, not so much with the idea of extending their technical knowledge as to gain an insight into the work of this organization. The outlook of the painter foremen is necessarily limited to his own field. On some roads they have opportunities to become general foremen or supervisors of painting, but very few of them become master carpenters. For this reason maintenance officers should spare no effort to make the master painter's work mean just as much to him as possible. Membership in the Maintenance of Way Master Painters' Association will do more than anything else to reveal to him the many opportunities of serving his employers by the exercise of his individual efforts.

The Problem of Rail Creeping

Maintenance of way work may be divided under two heads: renewals and upkeep. The first is required because things wear out or decay, the latter because they will not stay where they are put. If track could be constructed so that it would retain perfect surface and line, the railways would not need to spend money for surfacing and lining. Similarly, if track could be kept from creeping, the work of the track men would be made easier. Some of the complications of this latter problem are outlined in a paper by Dr. J. A. L. Waddell, which is reviewed on page 464 of this issue. While it is not expected that all of our readers will agree entirely with the author's interpretation of the information on which the study is based or upon the measures which he proposes for correcting this difficulty, it is to be hoped that the paper will be instrumental in reviving an interest in this subject.

Labor Saving Equipment Brings Results

No better illustration of the possibilities of the use of labor saving equipment in maintenance of way work can be desired than is found in the description of the organization which the Lehigh Valley has developed for the laying of rail, found on another page of this issue. The use of locomotive cranes in place of tong men has been in vogue on this road for several years, following the adoption of the 136-lb. rail, while the bonding apparatus is a development of the last year and the equipment to run up

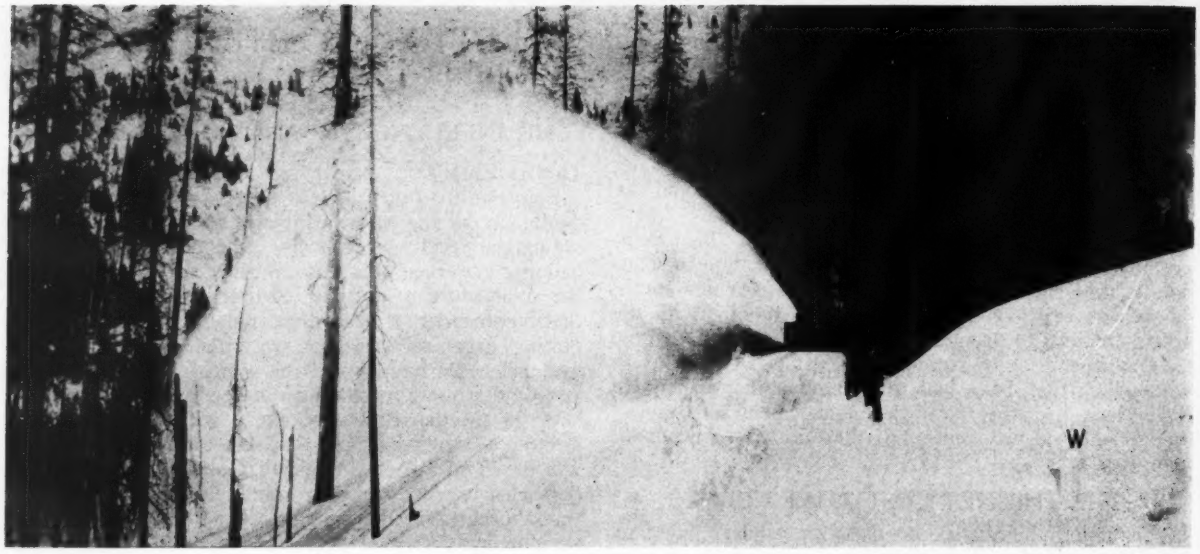


Fig. 1. Early Use of the Rotary Snow Plow on the Union Pacific

THE DEVELOPMENT OF SNOW FIGHTING EQUIPMENT*

The Transition From the Primitive Wedge Plow to the Powerful Rotary—How They Are Used

BY W. H. WINTERROWD
Chief Mechanical Engineer, Canadian Pacific, Montreal, Que.

IN CERTAIN portions of the United States and in Canada the successful and regular movement of trains during the winter months often depends upon the use of special equipment, the purpose of which is to remove snow and ice from the tracks and from the direct right of way.

The principal types of snow-fighting equipment may be generally classified as follows: Engine and pilot plows, push plows, wing plows, spreader plows, machine plows, flangers, ice cutters and snow sweepers.

ENGINE AND PILOT PLOWS

As far as the writer can ascertain, the first snow plow ever built was of the push plow type. This was a wedge-shaped wooden plow mounted on trucks and pushed in front of a locomotive. As this plow derailed frequently, a plow was constructed utilizing the front end of the locomotive as a support. Engine plows are still in use today and their general arrangement has not been changed, except to adapt them to larger locomotives. Several railways have advised that occasionally engine plows are secured permanently to the front of a locomotive assigned only to plow service, thus making a complete unit available at any time. For severe work this locomotive may be assisted by others.

The pilot plow was developed for use in light snow. One form of pilot plow is made by either boarding over the front of the pilot or filling between the slats with wood, thus converting an ordinary pilot into a makeshift snow plow. This arrangement has not always proved satisfactory, as the construction of pilots is not always sufficiently substantial to resist the strains imposed when plowing.

In moderate snows which do not pack hard or drift, and where the railway is free from deep cuts, and train operation is fairly frequent, engine and pilot plows are of great assistance in maintaining an open line. They are used on both freight and passenger locomotives.

A push plow is a self-contained unit consisting of a substantially built car with a wedge-shaped plow attached to its front end. This plow is generally pushed by one or more locomotives. The car may be fitted with flangers for cleaning the space between the rails. When the car is equipped with wings for widening the cut it is called a wing plow.

Many railroads use, for snow of moderate depth, a plow secured to the front end of a flat or ballast car, as shown

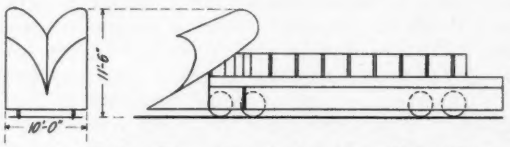


Fig. 2. A Wedge Plow Attached to the Front End of a Ballast Car

in Fig. 2, the car being loaded down with scrap iron or other heavy material.

Push plows were frequently built V-shaped, simply throwing the snow to each side without lifting it appreciably. These plows did not always prove satisfactory, as the snow was crowded aside, and if drifts were deep or in cuts it fell back on the track after the plow had passed. In hard drifts this plow packed the snow. In heavy side drifts the form of the plow tended to derailment. Also, when backing, unless shields were applied, snow was picked up on the back of the mold plates and carried into the trucks.

The square-nosed plow, Fig. 3, was developed to over-

*Abstracted from a paper presented before the meeting of Section III—Mechanical, American Railway Association, June, 1920.

come these objections. The front of this plow consists of two wedges. The main, or bottom wedge, with its cutting edge horizontally across the track, is a plane inclined upward and backward. Its purpose is to lift the snow. The upper, or vertical superimposed wedge is set some distance back from the front edge and is either V-shaped for single-track operation, or triangular for double-track operation. The upper wedge throws clear of the track the snow which has been lifted by the bottom wedge. The

Fig. 3. A Square Nosed, Double-Wedge Plow

advantages of the square-nosed plow are obvious. The snow is lifted and thrown without being packed, and with greatly reduced side thrust to the plow.

THE RUSSELL PLOW

One well-known push plow is the Russell design. This plow, Fig. 4, is of the square-nose type and is generally built of strong timbers reinforced with structural steel. The framing on which the mold boards are laid has as its main feature a heavy timber called the "backbone." Power is applied directly to the front of the plow through a steel reinforced timber bar, hinged or pivoted to the "backbone."

The surfaces of the plow which come in contact with the snow have been developed to minimize resistance. The back end of the car is several inches narrower than the front in order to relieve the car of snow friction against its sides. The top of the plow is fitted with a cupola or lookout from which its operation is controlled. These plows are made in several sizes for both single and double track operation and are often equipped with elevator wings and flangers.

The wings of the Russell plow are of the elevator type. The face of each wing is formed into two concave chutes called elevators that slope upward at an angle of approximately 30 deg. This type of wing first loosens the snow at the side of the cut and then carries it up and out. The distance the snow is thrown depends upon the speed at which the plow is traveling. These wings are forced out into position by means of gearing operated within the car. When not in use they fit into recesses in the side of the car.

SPREADER PLOWS

Fig. 5 shows what is commonly known as a snow spreader or dozer. The front of the car is V-shaped. A low V-shaped plow, with drop wings, is attached to the front. When these wings are dropped into working position they form a continuation of the plow mold plates.

The simplest form of spreader consists of a flat car with wings attached to each side, the wings being operated from the floor of the car by means of levers. This type of spreader is used by some roads to widen cuts after a plain push plow has passed. When widening cuts these wings are in such position that they serve as snowbank cutters, and snow is carried in toward the center of the track, from which it can be thrown by either a wedge plow or a rotary. When equipped with drag wings these spreaders are often called cut wideners.

The large side wings when extended to their full width have a total spread of approximately 30 ft. The snow is first cut by the V-shaped plow and, after it is thrown or pushed to one side, the long wings push it out still further. This type of plow is frequently used for cleaning up yards. Some roads utilize their ballast spreaders for this purpose.

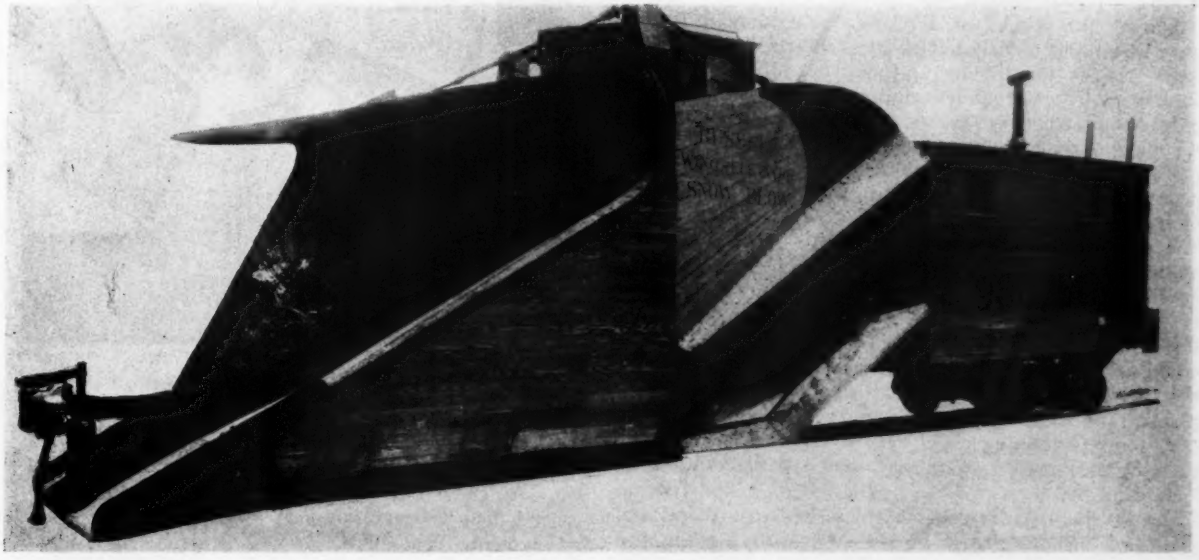


Fig. 4. A Russell Plow Used on the Grand Trunk

MACHINE PLOWS

On roads which have to fight deep drifts, snow slides, or other conditions beyond the capacity of push plows, the

rotary machine plow is used, and to date is the most effective instrument that has been developed for the purpose. These plows can work their way through deep cuts and slides where it would be impossible for any type of push plow to lift the snow and, in addition, can throw the snow clear of the track. If the snow is much higher than the top of the casing it is only necessary to loosen it and throw it down in front of the plow in order to have it picked up and thrown clear of the track.

J. W. Elliott was the original inventor of the rotary principle. His invention was improved by Orange Jull,

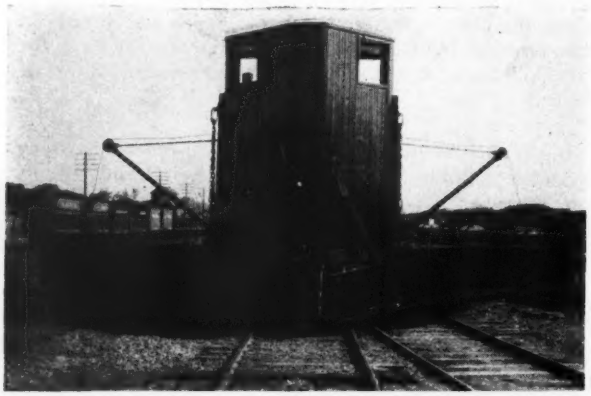


Fig. 5. A Spreader Plow Is a Useful Piece of Equipment, Especially for Clearing Snow from Yards

who applied a knife or cutting wheel in front of the Elliott fan wheel. In 1883 the Leslie Brothers built the first rotary embodying the Jull modification. The fan wheel was mounted on a hollow shaft in which revolved a solid shaft supporting the knife wheel. The fan and cutting wheels were revolved in opposite directions by means of a gear system.

During the winter of 1883-84, the Canadian Pacific gave this model a trial at Parkdale, Ontario. This preliminary trial, in which snow and ice were thrown over 300 ft., demonstrated the practicability of removing snow with a revolving wheel. This trial, however, indicated that the plow should be constructed so that snow could be thrown to either side of the track and that a flanger was necessary to prevent derailment in hard snow and ice and to leave a satisfactory rail after passing.

To overcome these objections the Leslie Brothers developed a wheel with manually reversible knives which could be changed in position to enable them to cut in either direction. They also applied a movable hood to the cylindrical portion of the casing through which snow could be thrown to either side of the track. In addition they designed an ice cutter, and a flanger, which were applied to the front truck of the plow.

A plow containing these improvements was built for them by the Cooke Locomotive Works of Paterson, N. J. One difficulty, however, was experienced. The friction cause by the snow passing between the knife wheel and the fan wheel absorbed more power than that required to cut and throw away the snow. The principle of opposite revolving wheels was then abandoned and the Leslie Brothers designed a single fan wheel with adjustable cutting edges. These cutting knives were attached directly to the wheel and reversed their position automatically as the direction of rotation was changed.

The Cooke Locomotive Works rebuilt the plow, embodying these improvements, and during the winter of 1886-87, it was put into service on the Union Pacific, doing particularly good work in opening up one 70-mile branch which had been blocked for some time and through which no plows of other types had been able to proceed.

In Canada, in 1888, the Canadian Pacific built eight of these plows in the Montreal shops, applying a fan wheel which had been still further improved by the Leslie Brothers.

Although there has been considerable development, the general arrangement of the modern rotary is very similar to that of the improved Leslie plows. As development progressed, the plows became heavier and were made more powerful. The size of the cutting wheels has increased to such an extent that on the heaviest and most modern plows the knives will cut through small trees and successfully open up snow slides containing a very large proportion of dirt, rock and gravel.

These snow plows, as well as many other early rotaries, were equipped with a wheel of the fan type, illustrated in Fig. 6. The back of this wheel consisted of steel plate to which the fan blades, or partitions, were secured. The fronts of the partitions were supported by heavy inner and outer rings. The reversible cutters were supported by trunnions riveted to these rings. When the plow was

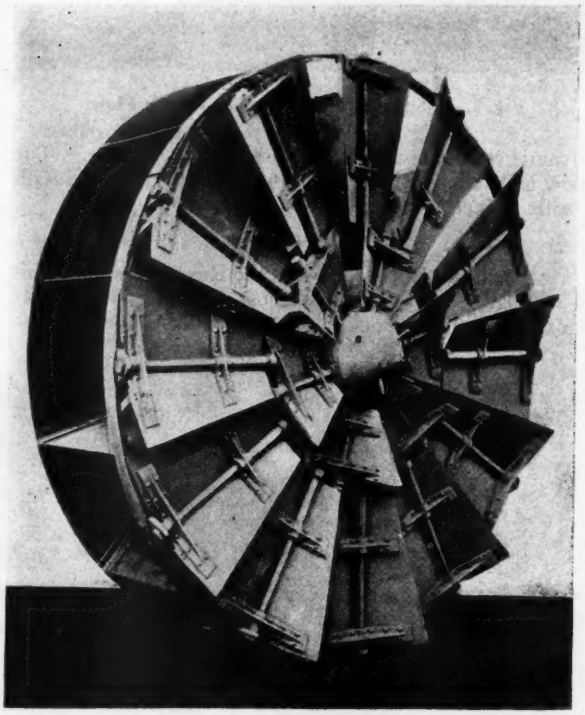


Fig. 6. One Type of Fan Wheel

in operation the revolving knives cut the snow and delivered it into the space between the partitions. The snow was then carried around the casing until the top opening was reached, through which it was thrown in a straight line by centrifugal force.

CANADIAN PACIFIC HEAVY ROTARY

The greatest test of a rotary snow plow is its ability to cut through snow slides. The plow can be subjected to no heavier service, a service which is occasionally required on all roads crossing the Rocky, Cascade and Selkirk mountains. The snow in these slides is not only packed exceedingly hard, but often contains trees and rocks. It is impossible for rotaries to overcome such obstacles. It is generally customary to probe the slide

with sounding rods to locate them and, if possible, they are removed by blasting or by being pulled out. Sometimes, however, these obstacles are not discovered and when the plow encounters them the ordinary cutting knives are generally damaged and the plow often put out of commission. The repair of the knives is generally difficult and slow.

During the winter of 1908-09, Sir George Bury, then general manager of the Canadian Pacific Western Lines, decided that a plow was needed which would not break down, and he stated that he wished a rotary plow with cutting knives of 2-in. armor plate, and the rest of the plow built in proportion. The following spring authority was given for two such plows and arrangements were made with the Montreal Locomotive Works for their construction. H. H. Vaughan, then assistant to the vice-president of the Canadian Pacific, engaged Mr. John Player, consulting engineer of the American Locomotive Company, to prepare the designs in collaboration with him. As a result, it was decided to modify the construction of existing plows considerably. It was Mr. Vaughan's idea that better results could be obtained by driving the plow wheel direct in marine engine style, and that the frame of the plow should resemble a bridge girder to support the casing or hood thoroughly. This idea has been justified, as the plows operate with practically no vibration. It was decided to build the plows, incorporating these ideas. The finished plows are shown in Fig. 7, and are the largest and most powerful that have ever been built.

The design of a tremendously strong and rugged wheel was one of the most important problems. To have made the cutting knives and scoops of exceedingly thick plate, and all other construction in proportion, would have resulted in a weight that was impractical. A wheel, however, was built which was quite different from any others and which was immensely strong. It was made of vast steel and weighs 24,000 lb. and was designed to run at 400 revolutions per minute. The main shaft is 11⅛ in. in diameter and 12 ft. 2 in. long. Behind the front bearing is a marine type thrust bearing with 10 collars. This thrust bearing, which is peculiar to this plow, is intended to take up the thrust ordinarily received by the back wall of the wheel casing. It has proved of decided benefit in service.

The engines are of the marine type and have cylinders 20 in. in diameter and 24-in. stroke. The trucks are of the six-wheel type specially designed for the purpose, and have cast-steel frames. The axles have 7-in. by 12-in. journals, and the steel-tired wheels are 34 in. in diameter. In working order, these plows weigh 260,000 lb. The weight is practically equal on the two trucks. The tender has a water capacity of 7,000 gal. and holds 16 tons of coal. It was made 32 ft. long, as, on account of bridge limitations, it was necessary to separate the weight of the plow from the weight of the heavy pushing locomotives.

The performance of these plows has warranted their construction. An officer who has used these plows states that the knives are quite sufficient for dealing with small trees. They have cut trees 4 in. in diameter. He also states that the slight angle at which the cutting knives are placed makes the plow somewhat slower in its progress through a slide, but the knives do not break when they strike obstructions such as rocks and trees.

The illustration at the head of this article is of historical interest. It shows one of the Leslie plows operating on the Union Pacific at a speed of four miles per hour on a 4 per cent grade with two inches of ice on the rail, and snow seven feet deep on April 18, 1890. Water trickling down the mountain sides and seeping through the snow, and then freezing, made the conditions practically ice-like from the top of the ties to the top of the bank.

Fig. 7. Rotary Snow Plow of Unusually Heavy Construction Used on the Canadian Pacific

FLANGERS

In order to clean up the track properly and to clear out the space between the rails for a depth of from two to four inches, flangers are generally used. Flangers are applied either to the front of the locomotive, temporarily to box cars or flat cars, or permanently to snow plows or flanger cars.

Flangers are applied to snow plows of various types. Sometimes flangers are attached to a special car. The smallest flanger car is practically a four-wheel truck to which flangers have been applied. A platform is built over the truck and carries the operating mechanism as well as a load of heavy material to hold the flanger down to its work. The large flanger cars are ordinarily of the caboose type, and are usually equipped with two four-wheeled trucks. The mechanism for lowering and raising the flanger is contained within the car. The majority of the large cars are equipped with two flangers in order that the car may be operated in either direction. On some roads the flangers are hung from the underframe of the car between the trucks. On other roads they are placed at the ends of the cars outside of the trucks.

All snow fighting equipment should be in good condition before the start of the snow season. This is best accomplished by means of a definite summer repair pro-

gram. Snow fighting conditions vary. Some roads, in order to determine the probable weather conditions, keep in close touch with the government observatories who advise the localities or areas in which storms exist or are probable.

OPERATION OF EQUIPMENT

Operation of equipment usually starts with the beginning of a storm. In clearing snow under ordinary conditions, pilot, push and wing plows are generally run at a good speed in order that the snow may be thrown well clear of the track. If a good speed is maintained, the plows will frequently go through a cut without stalling, whereas if the speed is slow the plow may catch or stall half way through the cut or drift, with the result that it may be stuck or buried and have to be shoveled out.

Particular care should be used upon approaching a cut, particularly one with a side drift at the entrance, as with a double-track plow sufficient side pressure may develop to cause derailment. Such an approach is generally squared off before pushing the plow into it. If the snow is too deep for the plow to handle it is leveled off by shoveling until reduced to a reasonable depth.

The man in charge of the snow plow must be one with considerable initiative, as weather and snow conditions vary greatly, and situations frequently arise which call for good judgment and quick decision.

Rotary snow plows are handled in an entirely different manner from the push and wing plows. Instead of depending upon speed to get through the drifts, the rotary plow approaches the drift slowly and the cutting wheel is fed into the drift instead of bucking it. A snow bank or slide is generally approached at a speed of about three or four miles an hour with the rotary revolving about 150 revolutions per minute. When coming close to the obstruction the speed of the wheel is increased, and the pusher engines keep moving just fast enough to keep the plow up against the drift. If the pusher engine crowds the rotary too much the pilot signals the engineer of the rotary to increase the speed of the wheel. In case the pusher engine still crowds the rotary, the pilot should apply the air brakes to check the pusher. If the pusher cannot be checked with the brakes, the pilot should signal the engineer of the pusher to shut off. He should respond quickly to prevent stalling the rotary. In case the rotary is stalled the flangers are raised and the plow drawn back four or five feet from the cut.

When again ready, the wheel is started and pushed into the cut. The rotary plow should never be pushed into the bank from a distance of more than four or five feet, as failure of the rotary will result. If the wheel of the rotary becomes blocked with snow the plow should be stopped and backed up a few feet. The snow can then be loosened between the casing and the scoops, after which the wheel will clear itself. Rotary plows should not be forced through snow deeper than the hood. When the snow is deeper than the hood the top bank should be shoveled off. In slides or ice formations the top of the obstruction is frequently loosened by blasting.

The successful operation of the rotary depends greatly upon the maner in which it is handled, and it is highly essential that the men on both the rotary and the pusher engines should be experienced men.

TREATMENT OF PILES WITH SALT ON NEW ORLEANS GREAT NORTHERN

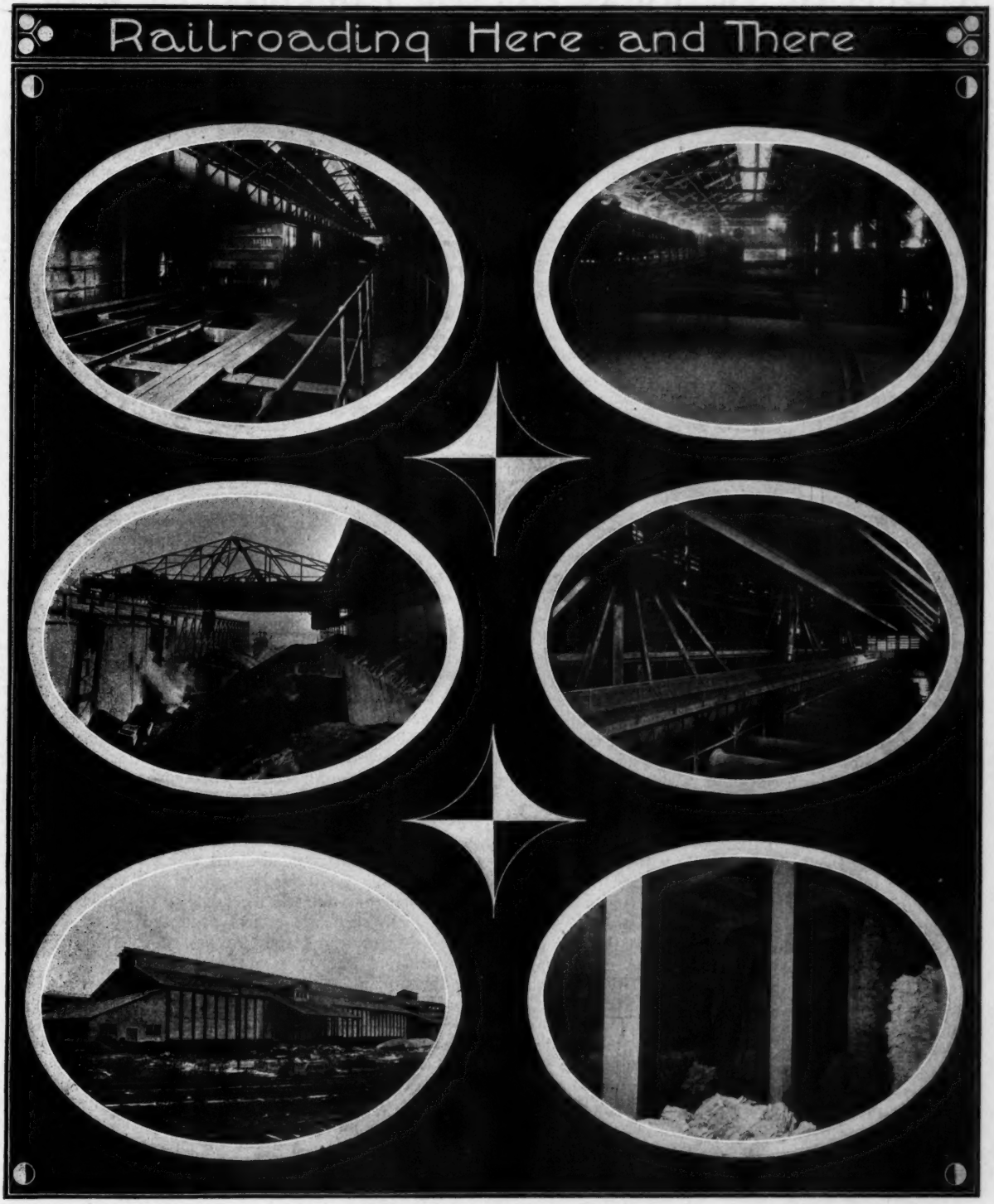
BY DR. HERMANN VON SCHRENK
Consulting Timber Engineer, St. Louis, Mo.

IN THE *Railway Maintenance Engineer* for January, 1918, a brief description was given of an experiment on the New Orleans Great Northern in the treatment of sap pine piles with salt boxes and, in view of the great shortage of creosote oil, this experiment is being watched with a good deal of interest. It will be remembered that shallow boxes were built around the heads of the piles immediately under the cap and that these boxes were filled with rock salt.

A Contrast—Untreated Piles on the Left, Piles Protected with Salt Boxes on the Right

After a recent inspection made by W. S. Hanley, superintendent of the New Orleans Great Northern, he reported on the condition of the piles, stating: "The piling which have been treated with salt are in splendid condition and appear to be really in better shape than the day they were driven, which was in March, 1913. A careful inspection at the ground line and below show the piling to be perfectly sound. The untreated piling are badly decayed and bridge will have to be rebuilt during the coming year."

The salt boxes have received attention very irregularly, but have been filled on an average of once a year. To date approximately fourteen hundred pounds of salt have been used on one bent at an average cost of 75 cents per 100 lb. The accompanying photographs show the splendid condition of the treated piling and the badly decayed condition of the untreated piling.



Photos by courtesy of the Universal Portland Cement Company

RAILROADS AS PURCHASERS OF CEMENT ARE INTERESTED IN ITS MANUFACTURE

The raw materials, limestone and slag, are delivered in bottom dump cars and deposited in storage bins (Fig. 1). After drying, grinding and mixing, the mixture is passed into cylindrical revolving kilns (Fig. 2), where it attains a temperature of 2500 deg. F. and gradually burns to a hard clinker. This clinker is deposited in storage piles (Fig. 3), where it is allowed to cool and after a period of seasoning is ground in tube mills (Fig. 4) to obtain the necessary degree of fineness. The finished cement is then stored in large concrete warehouses (Fig. 5) until it is shipped either in bulk or in sacks (Fig. 6).

A Resume of Ideas on the Creeping of Rails*

The Causes, Effects and Methods of Prevention Are Given in Replies by Representative Railway Men

IN ORDER to determine the cause of the creeping of railroad rails and if possible evolve a remedy, a questionnaire containing 16 questions pertinent to the phenomenon of creeping was sent to the federal manager or president of each of 70 principal railway systems of the United States, Canada and Mexico. Over 70 per cent responded and in most cases the reply consisted of reports from several or all of the various officers having to do with the maintenance of way departments. Representative replies are given below as they appeared in the paper.

A Result of Rail Creeping—Slewed Ties Under a Supported Rail Joint.

The direct or immediate results of rail creeping are the distortion of gage; bunching of ties and splitting of joint ties; closing of expansion joints at low points in the grade line and at turn-outs, crossings, movable spans and other points where the creeping is obstructed; throwing turn-outs, derails, crossings and other track devices out of line or adjustment; bunching of ballast between ties and squeezing it outward, also working the ballast from beneath the joint ties and leaving low joints; crowding ahead of switch-points and frogs, necessitating the continual moving forward, resetting and adjusting of switch-points and head-blocks in yards; battering of ends of rails; kicking sideways of track; splitting of angle-bars; loosening and pulling of spikes; shearing of spike heads and track bolts; kinking of rails; cutting of ties due to pulling of spikes and pounding of rails, thus starting decay; interference with the operation of interlocking; causing spring-rail frogs to stand open, and gaping of switch-points, thus inviting derailments.

A resumé of the answers showed that the rail creeping was proportional to the amount of traffic passing over a track and that with the traffic in one direction only the creeping was greater on the down grade, but that sometimes combinations of conditions may exist which induce considerable creeping on the up grade.

On a single-track line, rail creeping occurs in the direction of the heaviest tonnage, fastest speed and descending grades, the creeping under any of the conditions mentioned being aggravated by a soft or springy sub-grade. However, when the heavy traffic is up grade, the increased speed on the descending grade, combined with the tendency to creep down grade, may balance or overbalance the tendency to creep in the direction of heavy traffic.

The answers to the question, "On what portions of your line do you find the greatest creeping of rails—on tangents or on curves?" showed that the general opinion on this point was much divided. Rails very seldom start creeping on curves; for although the creeping there is often more pronounced, it is caused by the rails being crowded up from the tangent and thrown out of line on the curve. Creeping is greater on tangents, if the curves are properly elevated and properly operated. When they are improperly operated, however, as is the usual case, and the greater weight in consequence is thrown on either rail, the rail receiving the preponderance of weight will creep the most. The general deduction to be drawn from the evidence is that there is, on the average, but little difference between the amounts of creeping on tangents and on curves, and that which exists on the latter is usually carried over from the former and not started by itself, except when the super-elevation is improperly fixed.

Creeping of Rails on Curves

There are several factors which determine the amount of creeping on curves—the proportion of weight distributed on the two rails; the speed of the trains; the manner in which the ties are spiked; the direction in which the train loads are heavier, if any; and the character of the grade or foundation for the track. On curves where the inside rail receives the heavier load, on account of a too great elevation of the outside rail, the inside rail creeps faster. High speed, where the elevation is too small, will throw the greater portion of the weight on the outer rail; and the rail which receives the more weight, other conditions being equal, will creep the faster. Where there is no relative advance of either rail, it is quite likely that the effects produced by heavy, slow-speed freight trains and fast passenger trains are compensating.

The slipping effect of wheels on curves may also exert some influence on the relative amount of creeping of the two rails; but it is probable that the speed and super-elevation, which determine the distribution of the weight between the rails, are of more consequence. It is frequently reported that the outer or higher rail of a curve creeps faster than the inner rail. Variety of speed has more to do with rail creeping on curves (where the road-bed is right) than the degree of curvature. Slow, heavy traffic, passing over track that is elevated for high speed, has a tendency to crowd the inside rail down grade. If the elevation and speed are properly adjusted and both rails evenly loaded, the creeping will be about the same as on tangent.

The high rail on curves creeps more than the low one in the average case, as the super-elevation is usually insufficient for the speed used. On tangent, if one rail is out of surface and higher than the other, the high rail will creep the most. The more correct the track is to line, surface and composition of sub-grade, the closer the similarity will be in the creeping. Where one rail is

*Abstracted from a paper presented before the November 3, 1920, meeting of the American Society of Civil Engineers, by J. A. L. Waddell, consulting engineer, New York.

unbroken for a long distance by a frog or switch, it will creep more than the opposite rail which is broken in one or two places by turn-outs, cross-overs, etc.; also, one rail creeps more than the other in places where no satisfactory explanation can be offered.

For the same traffic, the creeping is very much greater on light rails than on heavy—frequently where light rail has been creeping and has been relaid with heavier steel, the creeping has been largely, if not entirely, eliminated. The lighter the steel the greater the tendency to creep, owing to the wave-like motion caused by the slight upward and then downward movement of the rails and ties just preceding a moving train or locomotive. It has been noted that the wave motion of 56-lb. steel is greater than that of 60-lb., and that the 56-lb. rail will creep faster than the 60-lb. Creeping on track having light rail sections is sometimes entirely overcome by replacement with rail of sections from 12-lb. to 20-lb. heavier.

The amount of creeping varies with the nature of the roadbed and also with the kind of ballast. The rate of creeping is greater where the surface is of unsound soils than where it is of compact soils. The creeping in sand ballast is very much greater than that in stone ballast, because of the greater ease of movement of the cross-ties in the former. The higher the standard of maintenance of a railroad, the less the creeping. Where the roadbed is composed of light materials and where the drainage is poor, more rail creeping is experienced than where the roadbed is of heavy materials and where good drainage prevails. Proper depth and kind of ballast lessen creeping, as better drainage is provided, and as train loads are better distributed over the roadbed, thus giving a more rigid structure and thereby lessening the wave motion in the track brought about by moving trains. Creeping is greater in freshly laid ballast than after the ballast has settled and solidified. Creeping is greater on embankments than in cuts.

Ties Slewed Under a Suspended Joint.

Creeping is influenced by temperature, especially in the north when a great deal of expansion and contraction is taking place each day due to the wide range of temperature between the hot days and the cool nights. During the winter months the creeping is less, due to the ties becoming anchored in the ballast, also because the embankment is firmer in a frozen condition and the wave motion of the steel under passing trains is thus greatly reduced. In the summer, and especially in the fall, rails are likely to creep into sags during the very cool nights when contraction is greatest, followed by extremely hot days, when the rails either shove ahead or buckle.

METHODS OF PREVENTING CREEPING

The rail splicing, considered as splicing only, has no effect on the creeping of rails. The modern splices nearly always have spike slots, which, when spiked, tend to hold the rail in position and prevent creeping, but a rail joint is not sufficient in itself to check creeping, however efficient it may be. Good joints with deep, double slots in the angle-bars assist; but after a time, under the constant influence of heavy traffic, the slots in the angle-bars become worn and disengaged from the spikes, or the spikes very often break off, due to over-stress. On a first-class track, where rail of not less than 80 lb. and up to 100 lb. is used, and the ballast is of sufficient depth and quality, and where the roadbed is of equally good and first-class consistency, it is a decided advantage to have rail splices provided with slots, while the contrary is the case on lines of lesser importance, and where the conditions as to first-class track are not entirely fulfilled. Track joints must be given preferred attention on all matters of track; and the keeping up of the efficiency of the rail splicing forms an important factor in the prevention of creeping.

Concerning the effect of tie-plates on the amount of rail creeping, there appears to be a wide diversity of opinion. Of the replies, 51 state that the tie-plates do affect it and 25 that they do not; but among the former there is a serious disagreement, for some say that the tie-plates decrease the creeping and others that they increase it. The evidence, however, tended to show that tie-plates without lugs increase rather than diminish the creeping; but that when the track is kept in good condition this detriment is small. Tie-plates are a necessity for first-class roads carrying heavy traffic, and no one would consider for an instant abandoning their use on the plea that they sometimes facilitate the creeping of rails.

The only satisfactory method of checking creeping, in addition to inserting spikes through the slots cut in the angle-bars, is the placing of rail-anchors so that the thrust of the creeping rail is brought to bear against the cross ties in addition to the joint ties. In addition, wherever possible, the drainage should be improved; the shoulder of the embankment widened where necessary; the ballast conditions improved; the track relaid with heavier steel; tie-plates used on every tie, on every other tie, or on every third or fourth tie.

As far as possible remove conditions which probably are responsible for creeping rails; respace the rails so that each joint has the proper expansion allowance; tighten the joint bolts uniformly; space the track ties to fit the joints so that they will afford uniform bearing throughout the rail length; tamp the ties carefully and see that the spaces between them and at the ends are well filled with ballast to hold the ties in position; and apply anti-creepers at the joint ties, at the quarter points in the rail lengths and as addotional points if necessary.

Rail creeping is attributed to a number of causes: (1) Temperature stresses, combined with a one-way movement; (2) wave motion in the rail—with traffic in one direction only, train wheels are always running up hill on the rail, tending to push it ahead; (3) braking stresses, the drag of the wheels over the rail combined with the wave motion; also the pushing or dragging force exerted by wheel flanges on curved track.

Rail creeping is caused by a wave motion of the rail in the direction of traffic, brought about by each set of wheels passing over the rail. The amount of creeping depends on the amplitude of the wave motion thus set up in the rail. This is determined largely by the amount, weight and speed of traffic; the preponderance of traffic in one direction; the rate of grade; and the elasticity of the roadbed. Creeping is augmented by the application of the brakes, since sliding friction is added.

LOCOMOTIVE CRANES SPEED UP RAIL LAYING

Lehigh Valley Develops Maintenance Methods to Reduce Costs by Use of Mechanical Equipment

THE DEVELOPMENT of mechanical equipment for the saving of labor in maintenance of way work has received a great deal of attention during the last few years, although it cannot be said that the railroads have yet made as thorough a use of such equipment as is both practicable and economical. In this development the Lehigh Valley has been one of the pioneers and especially so in the development and utilization of mechanical equipment and devices for the laying of rail. In this work locomotive cranes have been introduced for handling both the new and the old rail, while air compressors equipped with motor cars and air drills have been used for drilling the bond wire holes. The most recent addition to this work has been the experimental use of pneumatic wrenches for running up and tightening the new bolts, and in a lesser way for removing those on the old joints.

The results obtained as well as the details of the organization developed for this class of work is of interest to all maintenance men and also to the officers in the operating department. On October 15 on the Seneca division, between 6:45 a. m. and 5:10 p. m., 70 men with two locomotive cranes laid 1,250 rails. On the following day on the Wyoming division, between 7:20 a. m. and 2:30 p. m., 205 men laid 770 rails and then reloaded 402 rails and splices and two cars of tie plates by 5:30 p. m. New 136-lb. rail has been laid as fast as 159 rails in one hour with one crane, while daily average rates of from 80 to 110 rails per hour are maintained regularly. The outstanding feature of this method lies in the fact that the old track is in service up to the minute work is begun and that by the time the track men have passed over the new track it is completely finished and ready for service. No preliminary work whatsoever is done on the old nor is there any finishing up work on the new after the track has once been returned to service.

To obtain the best results by the Lehigh method complete co-operation and harmony is necessary between the operating and maintenance departments for the section of track which is to be laid must be given over completely to the maintenance department. On a double-track road this means that a section to be relaid must be operated as a single track line.

A Divisional Organization

Under the divisional system of organization in the Lehigh Valley the division superintendent is responsible for both operation and maintenance, reporting to the engineer maintenance of way on all matters pertaining to that department. Whenever new rail is to be laid plans for the work are made by him under the general supervision and direction of the engineer maintenance of way and the new material and accessories are procured and distributed along the tracks. The details of the work, that is, the distribution of the material, the building up of the necessary forces and the assembling and location of the needed mechanical equipment at some nearby siding, are handled by the division engineer, who reports to and works with the division superintendent. In general the forces are composed of the majority of the section men and foremen located on that part of the division on which the work is to be performed.

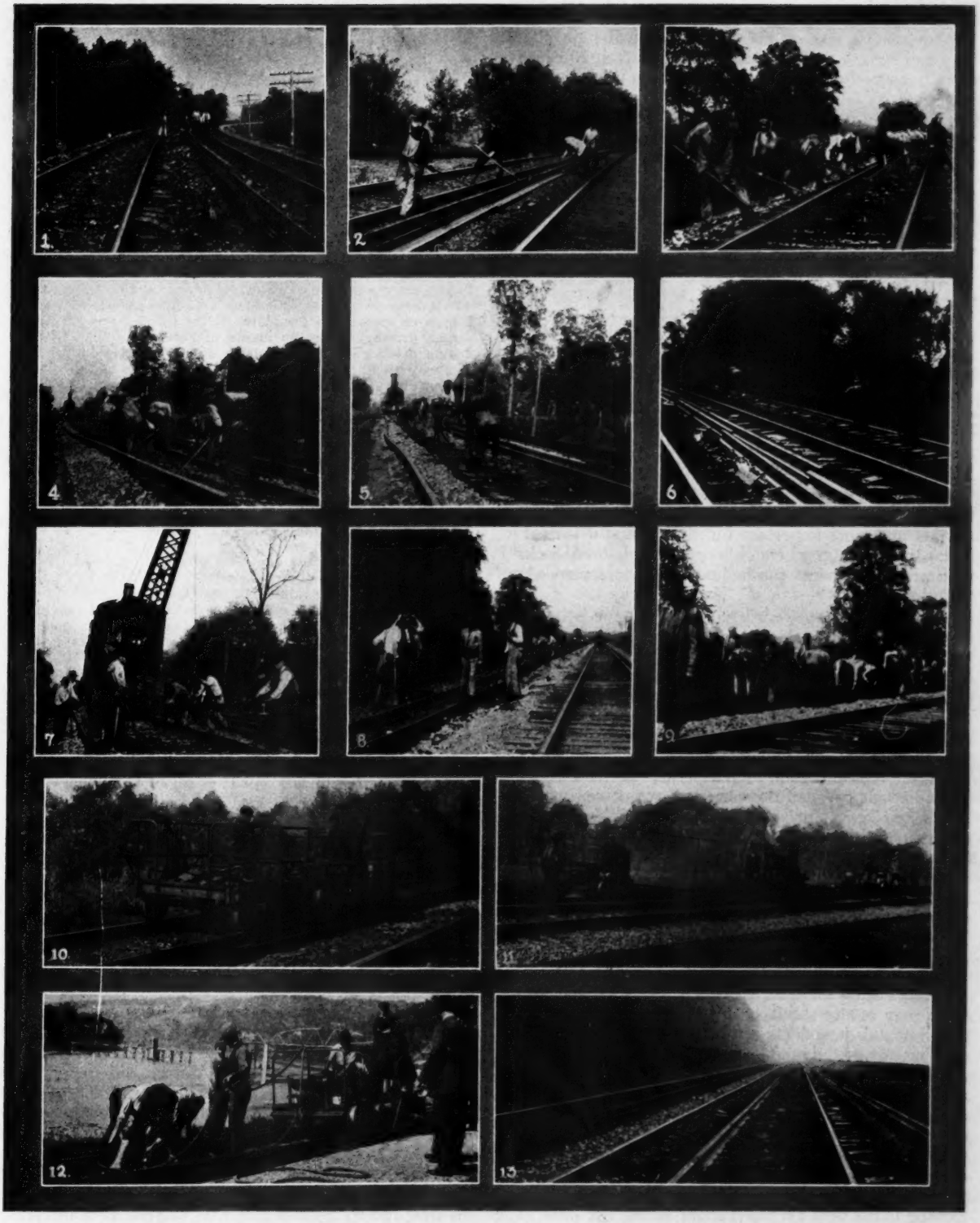
With all arrangements made beforehand and the proper material distributed the track is taken over at a predetermined hour in the morning. The mechanical equipment is then moved into place ready to start and the main track upon which rail is to be laid is then cut and swung over into the second main track unless there are crossovers or switches already in place. A trainmaster or some specially instructed assistant immediately takes charge of the movement of trains over the now single-track section and works in conjunction with the train despatcher with whom he stays in close touch by means of field telephones. In this operation a pilot engine is used, trains being allowed to enter the single-track section only from the end at which the pilot engine is stationed. Prior to the taking over of the track the roadbed had not been disturbed or prepared in any manner, the steel rails remaining fully bolted and tight. With the beginning of the work a large part of the force is started on one line of rail, pulling spikes, throwing out the old rails, tearing up the tie plates, etc., so that the locomotive crane can begin work with the least possible delay. With the laying of rail under way the work settles down to the following general method.

Each Man Has a Definite Duty

Repeated laying of rail has demonstrated that a force of approximately 200 men for each crane is necessary in order to keep the crane working at its capacity. This force is sub-divided into gangs with each man assigned to a definite duty and each gang so graduated in its assignment and numbers that there is little lost motion or wasted time in any of the individual gangs.

Usually the first gang consists of a few men who set up the new rail, mark the exact center by a chalk line across the head, and break joints in the old rails on curves at intervals of about ten rail lengths. These men are followed by a gang pulling spikes on one rail only and a second gang with lining bars who throw out the rail as fast as it is freed. The only tie plates are then picked up, thrown clear of the track, and creosoted tie plugs distributed, placed and driven in the spike holes. After this has been done the ties are adzed level and smooth, and the new tie plates which have been distributed previously are placed in position. This brings the work up to the place where the first crane is used. In laying new rail by a locomotive crane two spikes are first driven partly down in such positions as will maintain the ends of the rails to gage. At the same time the boom of the crane is swung over and the hoisting cable hooked on the new rail at its exact center as indicated by the chalk mark. The rail is steadied as it is swung into position by two men at each end who guide it against the spikes and the end of the previously laid rail. Proper expansion is secured by inserting a shim, which is withdrawn as soon as the rail has been seated. Two men with lining bars then hold the rail tightly against the two spikes, while two additional ones are driven on the opposite side. A small piece of scrap wood is placed over the abutting ends of the rails to prevent crowding and the crane moved forward one rail length, where the operation is repeated. Practically all of the work described above is carried on simultaneously and the entire operation is completed in a very short time. In actual practice the rail is laid at a rate of from 25 to 40 sec. or less per rail.

The crane organization is followed by men gaging the new rail at the center and spiking it at that point. Where



SUCCESSIVE STEPS IN THE RELAYING OF RAIL BY MODERN METHODS

1, *Before starting work—track full spiked and bolted;* 2, *setting up rails and marking centers;* 3, *pulling spikes;* 4, *throwing rail out;* 5, *inserting tie plugs;* 6, *placing tie plates;* 7, *lifting a* 136-*lb. rail in place with a locomotive crane;* 8, *spiking;* 9, *full spiking;* 10, *motor car with tools following gang;* 11, *bonding rails by air-driven tools;* 12, *running up nuts with air-driven nutters;* 13, *on completing work—track full spiked, bolted and bonded.*

a second crane is used a second gang, organized and working in the same manner as the one preceding the first crane, loosens up and throws out the remaining rail, after which new steel is laid in the manner already described.

With the passing of the second crane the tie plates are straightened, the joint ties adzed to a 1 to 20 cant to correspond to the cant of the tie plates and the continuous joints placed in position, where they are held with one bolt. The insulated joints are next put in and completely bolted up by one or two men, who do nothing else.

POWER TOOLS ARE USED

The mechanical equipment for drilling bond wire holes in the rail is next in line. This consists usually of an air compressor unit, to which are attached four air drills. This is sometimes pushed by hand, in which case the work progresses one rail length at a time. In other cases it is coupled up with two motor cars, one on each end, and at a distance of about approximately 25 ft. from the compressor. A long air line extends over the top of the three units supplying air to the four drills, each of which handles one joint or a total of three rail lengths at a time. The motor car operators or the man pushing the compressor, as the case may be, distribute the bond wires as the outfit moves along. This method was described in detail on page 427 of the November issue of the *Railway Maintenance Engineer*.

This unit is generally followed by a motor car and two trailers carrying tool grinders and extra tools. This has another and more important function in that it is used to transport the gangs where only one crane is used, back to the start, so that work can be immediately commenced on the other rail.

With the joints placed in position and the bond wire holes drilled, the tracks, where two cranes are used, or the one rail, where only one crane is operated, is ready for the final work. This is performed by a series of gangs varying from two men up to 30 or 40, who straighten tie plates, bolt up the joints, gage the rail, full spike, clear out for and place rail anchors, install the bond wires and signal connections. This is shown more in detail in the typical organization described in the latter part of this article. When these gangs have passed over the tracks it is ready for service. In actual field work with two cranes this organization extends over a distance of about one-half mile, the rear end closing up in about 30 min. after the last rail has been laid by the crane. During this closing up period the track is cut back and made ready for through service.

PNEUMATIC WRENCHES

In several recent operations of laying rail a further attempt has been made to speed up the work and at the same time reduce the labor item. This consisted of the experimental introduction of pneumatic wrenches for running up and tightening the track bolts. Being the first attempt the organization worked out for this operation was more or less a makeshift. In one instance an air compressor was pushed along by hand and four pneumatic wrenches attached to it by air hose. This arrangement covered two joints at one time. In another case a motor car was attached to the compressor and only two wrenches operated. The time for running up a joint and moving to the next averaged about 30 sec. per joint. The men released by the machine were placed at work on the old rail preparing it for loading.

Figuring on a one crane basis, as any multiple can be used efficiently up to four on one section of track provided sufficient men can be secured, the following is a typical organization in detail. In the instance where this organization was used the new rail was straightened up as unloaded and the centers marked previously to the actual operation of laying. All foremen shown in the following participated in the actual work as well as supervising:

A TYPICAL ONE-CRANE ORGANIZATION

Preparatory work:
- 3 men removing every tenth joint on the old rail on curves.
- 24 men pulling spikes. This included two foremen.
- 14 men swinging out old rail. Two foremen with section gangs.
- 3 men throwing out old tie plates.
- 3 men placing creosoted tie plugs in spike holes.
- 2 men driving creosoted tie plugs in spike holes.
- 12 men adzing ties. One section foreman included.
- 2 men sweeping off ties after adzing.
- 5 men placing new tie plates. One foreman included.

Crane organization:
- 4 men on rail, two on each end to steady and guide into place.
- 1 man on crane hook. The foreman in charge of crane forces.
- 1 man on expansion template.
- 2 men driving spikes on inside of new rail.
- 2 men driving spikes on outside of rail after laid.
- 1 man with lining bar to bar rail to place as laid.
- 2 men operating crane. The operator and fireman.

Following the locomotive crane:
- 1 man adzing joint ties for a 1 to 20 cant.
- 10 men placing new joints. Two foremen included.
- 5 men removing rail anchors from old rail.
- 1 man placing insulated joints.
- 12 men gaging new rail.
- 34 men full spiking.
- 30 men bolting up joints.

Bonding and finishing gangs:
- 4 men operating air drills.
- 2 men operating motor cars and distributing bond wires.
- 1 man operating air compressor.
- 2 men bonding new rail.
- 5 men clearing out for rail anchors. One foreman included.
- 5 men placing new rail anchors. One foreman included.
- 2 men operating motor car, two trailers, with extra tools, etc.
- 3 men checking up on tie plates, spiking and joints, etc. One foreman included.
- 3 men carrying drinking water.
- 1 man changing wire at signal connections.
- 1 man soldering signal connections.

With the experimental introduction of the pneumatic wrenches the organization was changed from that shown above to pull off the 30 men whose duty it was to bolt up the rail joints and substitute the following force:

- 2 men on pneumatic wrenches.
- 1 man tapping joints into place.
- 1 man on air hose.
- 1 man operating motor car.
- 1 man operating air compressor.

The results obtained by this method have been exceptionally satisfactory to both the operating and maintenance of way departments. In general, stretches of track not over five or six miles are taken over and the operation of trains over single track for this length has not caused any appreciable delay or attendant expense. The one strong feature of this method lies in the fact that a longer unit of completed track can be laid in less time and with a much smaller number of men. The Lehigh Valley system of using section forces for this work has proved out well for the results have shown that in this way more competent men are secured and better work is performed since the men are working both with and under the direct supervision of their regular foremen. In subdividing the forces into gangs of varying sizes the regular section forces are kept intact wherever possible and an effort is made to have at least one foreman with every unit. One of the striking features of this adoption of labor-saving equipment and the sub-dividing of the forces into smaller units, each asigned to its particular duty or task, has been the creation of a strong spirit of competition between the individual units.

Noonday at the Camp

A CENTRALIZED ORGANIZATION FOR FEEDING MEN*

The Plan in Use on the Nashville, Chattanooga & St. Louis Has Been Found Advantageous

BY HUNTER MCDONALD
Chief Engineer, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

WHEN I began work for the Nashville, Chattanooga & St. Louis in 1879, all the men in extra gangs, called then floating gangs, and still called so by the men themselves, were paid 60 cents per day, quartered in boarding cars called cabooses, and fed at the company's expense. Section men were paid 75 cents per day, and given their house rent and old ties for fuel when living in company houses. Early in the '80s these rates were advanced to 70 and 90 cents, respectively. From 70 cents the rate had gradually advanced to $1 in 1916. At this time extra gang labor became unusually scarce, and consequently very inferior in quality. In order to recruit and improve the forces, their rate of pay was advanced from $1 to $1.40. No deduction has ever been made for board, it being a part of the compensation. No deduction is made for board on rainy days when the men do not work. They have always been permitted to make week-end trips to their homes, which are usually as far away from their work as the foreman will stand for. All extra gang laborers are negroes, although we have had such gangs composed of native whites when negroes could not be obtained. The class of negroes secured on these gangs has generally been inferior to that on the section gangs.

Section gangs in mountain regions are either all native white or mixed white and negro. In strictly agricultural regions they are, with few exceptions, negroes. The forces usually fall off when planting season arrives and increase when crops are laid by. Many of the negroes on extra gangs are unmarried, many are ostensibly polygamists, visiting different homes at different week-ends, many are gamblers, and most of them were drinkers before prohibition made it impossible for them to get whisky. Some of them are preachers and all are gregarious. They like "floating," as they call it, because the food is better and more plentiful than they get elsewhere, because of their love of the "gang" and the enjoyment of the week-end trip on the train, with a check in the hat band which is exhibited at every station while the wearer is awake by sticking the head out of the window. In one or more of their sleeping cars there is usually a preacher and a banjoist, and all of them sing both in camp and at work. Most of their work is done to musical calling or timing by their squad leader.

In 1907 the system of feeding the men was extended to bridge and building gangs, composed altogether of native white men. Prior to that time these men were either boarded by the foreman or they "messed," buying their food, employing the cook and dividing the expenses at the end of the month. The foreman generally received his board free as compensation for looking after the mess. The company furnished the cook stove, utensils and fuel and dining room equipment.

At the time of instituting the system of feeding all the men living in outfit cars, the board, including the cook's pay, was estimated to cost 30 cents per day for extra gangs and 35 cents for bridge and building gangs. Later, as the price of food and wages of cooks advanced, the charges were increased to 50 cents for extra gangs and 60 cents for bridge and building gangs. Stoppages for board at 60 cents per day are made on pay rolls for men on bridge and building gangs. The foreman is boarded free in consideration of his superintending the boarding.

The system of purchasing supplies up to this time was for each division engineer to take bids monthly for the requirements of his division and award the contract for the supplies to the lowest bidder. The costs were computed by dividing the ration bill for each gang, including the cook's pay, by the number of days' work performed by the gang during the month. Naturally, it varied according to the size of the gang and the number of days not worked, as well as with food costs and wages of cooks. A statement showing the costs of every gang on every division was made up monthly in the office of the chief engineer and sent to each division engineer in order that each might discover and remedy his leaks.

In 1918 the cost of boarding the men had run far beyond the amount received by the company for such board. Not wishing to raise the charge for board, a study was made in the chief engineer's office to see what economies might be effected by a system of centralized purchasing

*Presented before the annual convention of the American Railway Bridge and Building Association at Atlanta, Ga., on October 26.

Form 756—Page 1.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY

Subsistence Return for the Month of.....19[illegible]... Foreman.....

ARTICLES	Designation	On Hand 1st of Month	Received During Month	Expended During Month		On Hand End of Month	Ration	REMARKS
				Quantity	Cost			
English Bellies	Lbs.							
Ham	Lbs.							
———	Lbs.							
D. S. Extras	Lbs.							
Salmon (Canned)	16 oz. cans							
Cheese	Lbs.							
———								
Flour	Lbs.							
Corn Meal	Lbs.							
Macaroni	8 oz. pkgs.							
Rolled Oats	1½ lb. pkgs.							
Baking Powder	16 oz. cans.							
A. & H. Soda	Pkgs.							
Navy Beans	Lbs.							
Pinto Beans	Lbs.							
Lima Beans	Lbs.							
B. E. Peas	Lbs.							
Rice	Lbs.							
Hominy (Canned)	No. 2½ cans							
Potatoes	Lbs.							
Sweet Potatoes	Lbs.							
Onions	Lbs.							
Cabbage	Lbs.							
Tomatoes (Canned)	No. 2½ cans							
Corn (Canned)	No. 2 cans							
Peas (Canned)	No. 2 cans							
Beans (Canned)	No. 2 cans							
Kraut (Canned)	No. 2½ cans							
Sw. Potatoes (Canned)	No. 2½ cans							
Pie Peaches (Canned)	No. 2½ cans							
Apples (Canned)	No. 2½ cans							
Gooseberries (Canned)	No. 2½ cans							
Blackberries (Canned)	No. 2½ cans							
Table Peaches (C'n'd)	No. 2½ cans							
Pears (Canned)	No. 2½ cans							
Apricots (Canned)	No. 2½ cans							
Prunes	Lbs.							
Peaches (Evaporated)	Lbs.							
Apples (Dried)	Lbs.							
Jelly	5 lb. pails							
Preserves	5 lb. pails							
Coffee	Lbs.							
———								

Subsistence Return, Form 756, Page 1

Form 756—Page 2

ARTICLES	Designation	On Hand 1st of Month	Received During Month	Expended During Month		On Hand End of Month	Ration	REMARKS
				Quantity	Cost			
Sugar	Lbs.							
Milk (Evaporated)	6 oz. cans							
Vinegar	Quarts							
Catsup	16 oz. bot.							
Pepper Sauce	8 oz. bot.							
Mustard (Prepared)	8 oz. jars							
Pickles	Quart jars							
Salt	Lbs.							
Pepper (Black)	Lbs.							
Cinnamon	1 oz. pkgs.							
Cloves	1 oz. pkgs.							
Ginger	1 oz. pkgs.							
Nutmeg	1 oz. pkgs.							
Lard	Lbs.							
Sorghum	Gallons							
Karo Syrup	No. 10 pails							
Lemon Extract	1½ oz. bot.							*
Vanilla Extract	1½ oz. bot.							
Laundry Soap	Bars							
Ivory Soap	Bars							
Lava or Pumice Soap	Bars							
Tar Soap	Bars							
Washing Powder	Pkgs.							
Lye	Cans							
———								
Dairy Account								
Total cost of provisions								
Wages of Cooks								
Total Cost								

Total days in time book - - - - - .....

Total days men boarded not working .....

Total days transients boarded - - - .....

Total - - - - - - - - - .....

Average Cost of Board Per Day

Exclusive of Cooks Wages	Including Cooks Wages

The following transients were served meals during month (show names, dates and number of meals).....

Approved: .....

Correct: .....

Foreman.

This form should be filled out by foreman, leaving blank columns headed "Cost" and "Ration" and mailed to Division Engineer's office with Provision Requisition.

Division Engineer will fill in column headed "Cost" and will complete column headed "Ration" and forward to Purchasing Agent with Provision Requisition.

Subsistence Return, Form 756, Page 2

Form No. 758

COMMISSARY DEPARTMENT

THE NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY

BRIDGE AND BUILDING GANG RATION

For Carpenter, Bridge, Concrete, Fence and Water Supply Gangs.

Articles	Per Man Per Day		Remarks
1 English Bellies (Bacon)	8. oz.	0.5 lbs.	
Ham	8. "	0.5 "	
Shoulders	8.96 "	0.56 "	
Tripe	8 "	0 5 "	Not to exceed 10% of total allowance
Cooked Brains	8 "	0 5 "	Not to exceed 10% of total allowance
Sardines	8 "	0 5 "	Not to exceed 10% of total allowance
Codfish	8 "	0 5 "	Not to exceed 10% of total allowance.
Oysters	8 "	0 5 "	Not to exceed 10% of total allowance
D. S. Extras	8.96 "	0.56 "	
Salmon (Canned)	11.2 "	0.7 can (16 oz.)	Not to exceed 10% of total allowance.
Cheese	8. "	0.5 lbs.	Not to exceed 10% of total allowance.
2 Flour	12. "	0.75 lbs.	Not to exceed 50% of total allowance
Corn Meal	14.4 "	0.9 "	
Macaroni	4.8 "	0.6 pkg. (8 oz.)	
Rolled Oats	10. "	0.5 " (1½ lb.)	
3. Baking Powder	0.12 "	.0075 can (16 oz.)	
4. A. & H. Soda	0.005 pkg.		
5. Navy Beans	3.2 oz	0.2 lbs	Navy Beans plus Lima Beans must not exceed 60% of total allowance
Pinto Beans	3.2 "	0.2 "	
Lima Beans	3.2 "	0.2 "	Remaining 40% must be made up of other items
B. E. Peas	3.2 "	0.2 "	
Rice	3.2 "	0 2 "	
Grits	3.2 "	0 2 "	
Pearl Hominy	3.2 "	0.2 "	
Hominy (Canned)	12.8 "	0.4 can (No. 2½)	
6 Potatoes	22.4 "	1.4 lbs.	
Sweet Potatoes	22.4 "	1.4 "	
Onions	22.4 "	1.4 "	Not to exceed 10% of total allowance
Cabbage	22.4 "	1.4 "	Not to exceed 30% of total allowance
Tomatoes (Canned)	16. "	0.5 can (No. 2½)	Canned vegetables not to exceed 50% of total allowance
Corn "	10. "	0.5 " (No. 2)	
Peas "	10. "	0.5 " (No. 2)	
Beans, String "	10 "	0.5 " (No. 2)	
Kraut "	16. "	0.5 " (No. 2½)	
Red Kidney "	10 "	0.5 " (No. 2)	
Baked Beans "	10 "	0 5 " (No. 2)	
Beets "	10 "	0 5 " (No. 2)	
Sw. Potatoes "	16. "	0.5 " (No. 2½)	
7. Pie Peaches (Canned)	3.20 "	0.10 " (No. 2½)	
Apples "	3.20 "	0.10 " (No. 2½)	
Gooseberries "	3.20 "	0.10 " (No. 2½)	
Blackberries "	3.20 "	0.10 " (No. 2½)	
Table Peaches "	2.24 "	0.07 " (No. 2½)	
Pumpkin "	3.20 "	0 10 " (No. 2½)	
Mincemeat "	3 20 "	0 10 " (No. 9.03)	
Apricots "	2.24 "	0.07 " (No. 2½)	
8. Prunes	1.28 "	0.08 "	
Peaches (Evaporated)	1.28 "	0.08 "	
Apples (Dried)	1.28 "	0.08 "	
Jelly	2.80 "	0.025 pail (5 lb.)	Jelly and Preserves not to exceed 50% of total allowance.
Preserves	2.80 "	0.025 " (5 lb.)	

Ration for B. and B. Gangs, Form 758

Form No. 759

COMMISSARY DEPARTMENT

THE NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY

TRACK GANG RATION

(For all Track Gangs.)

Articles	Per Man Per Day		Per Gang Per Month
1. English Bellies (Bacon)			40 lbs. per gang per month.
Ham			40 lbs. per gang per month.
Shoulders			50 lbs. per gang per month.
Salmon (Canned)			80 cans (16 oz.) per gang per month.
Tripe			50 cans (16 oz.) per gang per month.
Cooked Brains			50 cans (16 oz.) per gang per month
Sardines			50 cans (16 oz.) per gang per month.
Codfish			50 lbs. per gang per month.
Oysters			80 cans (8 oz.) per gang per month.
Cheese			50 lbs. per gang per month.
2. D. S. Extras	10.7 oz.	.67 lbs.	
3. Flour	12. oz.	0.75 lbs.	Not to exceed 40% of total allowance.
Corn Meal	16. "	1.00 "	
4. Macaroni			4 pkgs. (8 oz.) per gang per month
Rolled Oats			3 pkgs. (1½ lb.) per gang per month.
5. Baking Powder	0.12 oz.	.0075 can (16 oz.)	
6. A. & H. Soda	0.003 pkg.		
7. Navy Beans	4.8 oz.	0.3 lbs.	Navy Beans plus Lima Beans must not exceed 60% of total allowance. Remaining 40% must be made up of other items.
Pinto Beans	4.8 "	0.3 "	
Lima Beans	4.8 "	0.3 "	
B. E. Peas	4.8 "	0.3 "	
Rice	4.8 "	0.3 "	
Grits	4.8 "	0 3 "	
Pearl Hominy	4 8 "	0.3 "	
Hominy (Canned)	12.8 "	0.4 can (No. 2½)	
8. Potatoes	12.8 oz.	0.8 lbs.	
Sweet Potatoes	12.8 "	0.8 "	
Onions	12.8 "	0.8 "	Not to exceed 10% of total allowance
Cabbage	12.8 "	0.8 "	Not to exceed 30% of total allowance.
9. Tomatoes Canned			1 can per man per day.
Corn "			1 can per man per day.
Peas "			1 can per man per day
Beans, String "			1 can per man per day.
Red Kidney "			1 can per man per day
Baked Beans "			1 can per man per day
Beets "			1 can per man per day
Kraut "			1 can per man per day
Sw. Potatoes "			1 can per man per day
10. Pie Peaches Canned			15 cans (No. 2½)
Apples "			15 cans (No. 2½)
Gooseberries "			15 cans (No. 2½)
Blackberries "			15 cans (No. 2½) For Foreman and Assistant
Table Peaches "			15 cans (No. 2½) Foreman per month.
Pumpkin "			15 cans (No. 2½)
Mincemeat "			15 cans (No. 2½)
Apricots "			15 cans (No. 2½)
11. Prunes	0.80 oz.	0.05 lb.	
Peaches (Evaporated)	0.80 "	0.05 "	
Apples (Dried)	0.80 "	0.05 "	

Ration for Extra Gangs, Form 759

and distribution and strict rationing. The study indicated that no increase in charge for board would be necessary and that substantial savings would be effected at the then existing rates. The purchase of dining car and subsistence supplies was therefore assigned to the purchasing agent and a commissary agent appointed to look after it. Subsequent experience fully demonstrated the accuracy of this conclusion, but later advances in food cost and cooks' wages have again put the cost above the amount received.

The circular inaugurating the plan, dated October 18, 1918, prescribed the following forms: Requisition, No. 755; Subsistence Return, No. 756; Dairy Account, No. 757; Ration for B. & B. gangs, No. 758, and Ration for Extra gangs, No. 759.

The ration allowance was estimated largely from the past average consumption of various articles, was checked with prevailing U. S. Army rations, and was known to be ample if proper economy and care were exercised. As a check against requisitions, the ration allowance is required to be filled in on the subsistence report. Requisition Form 755, Subsistence Report Form 756 and Dairy Account Form 757 are prepared by the foreman and sent to the division engineer's office. The division engineer prepares a summary of all supplies ordered, copies each requisition and subsistence report, fills out the last two columns and forwards three copies of each to the purchasing agent, sending a copy also to the chief engineer.

Each foreman is allowed to purchase locally dairy supplies, including fresh meat, butter, eggs and milk, equal in amount to an authorized allowance per man, at present 6 cents per day for bridge and building gangs and 15 cents each per day for the foreman and assistant foreman, the only white men on extra gangs. These purchases are shown on Form 757, Dairy Account, certified to by the foreman and forwarded with the requisition, checked by the division engineer and commissary agent, and vouchered by the purchasing agent. In emergency, other than dairy supplies can be purchased locally and during the summer season fresh vegetables and fruit can be purchased in lieu of potatoes, canned goods, etc., allowed on the ration list. These purchases are offset by deductions from the requisition and emergency purchases must be fully explained.

The Food Is Served in Sanitary Surroundings

A Kitchen and Its Crew
Mess Car of a B. and B. Gang

Converted Coach as a Bunk Car
Dining Hall for a Negro Extra Gang

The circular described the duties of the commissary agent as follows:

1. To adopt the most economical methods of purchasing and distributing.
2. To keep in touch with the different departments, by personal investigation, to see that no waste is occasioned in handling at the point of consumption.
3. To see that cook and dining cars are kept in a sanitary condition.
4. To keep a check on all requisitions to see that they conform to the balanced ration and subsistence reports.
5. To understand that he has no authority to issue orders to employees of the above departments, but is to act in an advisory capacity, and when conditions needing correction are not given prompt attention, report the facts to the purchasing agent.

The commissary agent checks all requisitions carefully and sees that they are properly balanced as to food values and in accordance with the ration allowance for the esti-

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY

PROVISION REQUISITION No.....

Ship to.....Division Engineer.
Care.....Foreman.
.....Station.

Shipment to be billed "Company Service."

the following provisions required for subsistence of.....gang during the month of.....192...
Quantities based on.....man days. (Estimated.)

Check	Quantity	Article	Size		Check	Quantity	Article	Size
	lbs.	Eyeflish Bellies				lbs.	Prunes	
	lbs.	Ham				lbs.	Peaches (Evap.)	
	lbs.	Shoulders				lbs.	Apples (Dried)	
	lbs.	D. S. Extras				pails	Jelly	5 lb. pails
	cans	Salmon	16 oz. can			pails	Preserves	5 lb. pails
	lbs.	Cheese				lbs.	Coffee	
	lbs.	Flour				lbs.	Sugar	
	lbs.	Corn Meal				cans	Milk (Evaporated)	6 oz. cans
	pkgs.	Macaroni	8 oz. pkg.			bot.	Vinegar	Qt. bottles
	pkgs.	Rolled Oats	1½ lb. pkg.			bot.	Catsup	16 oz. bottles
	cans	Baking Powder	16 oz. can			bot.	Pepper Sauce	8 oz. bottles
	pkgs.	A. & H. Soda				jars	Mustard (Prepared)	8 oz. jars
	lbs.	Navy Beans				jars	Pickles	Qt. jars
	lbs.	Pinto Beans				lbs.	Salt	
	lbs.	Lima Beans				lbs.	Pepper (Black)	
	lbs.	B. E. Peas				pkgs.	Cinnamon	1 oz. pkg.
	lbs.	Rice				pkgs.	Cloves	1 oz. pkg.
	cans	Hominy	No. 2½ can			pkgs.	Ginger	1 oz. pkg.
	lbs.	Potatoes				pkgs.	Nutmeg	1 oz. pkg.
	lbs.	Sweet Potatoes				lbs.	Lard (Compound)	
	lbs.	Onions				pails	Molasses	No. 10 pails
	lbs.	Cabbage				gals.	Sorghum	
	cans	Tomatoes	No. 2½ can			pails	Karo Syrup	No. 10 pails
	cans	Corn	No. 2 can			bot.	Lemon Extract	1½ oz. bottles
	cans	Peas	No. 2 can			bot.	Vanilla Extract	1½ oz. bottles
	cans	Beans	No. 2 can			bars	Laundry Soap	
	cans	Kraut	No. 2½ can			bars	Ivory Soap	
	cans	Sw. Potatoes	No. 2½ can			bars	Lava or Pumice Soap	
	cans	Pie Peaches	No. 2½ can			bars	Tar Soap	
	cans	Apples	No. 2½ can			pkg.	Washing Powder	
	cans	Gooseberries	No. 2½ can			cans	Lye	
	cans	Blackberries	No. 2½ can					
	cans	Table Peaches	No. 2½ can					
	cans	Apricots	No. 2½ can					

Order only articles and sizes listed above. Foremen will make requisitions the first of each month and mail one copy together with Subsistence Return so as to reach Div. Engr. on or before the 6th of the month.
Div. Engrs. will mail requisitions in TRIPLICATE accompanied by one copy of Subsistence Return so as to reach the Purchasing Agent on or before the 10th of the month.

Signed ..... Date .....
Approved ..... Date .....
Approved ..... Date .....

Provision Requisition, Form 755

mated number of men to be worked for the succeeding month. After the quantities to be purchased are determined, bids are solicited from reliable firms for such as are not already in stock. Complete specifications accompany all solicitations for bids. Orders are awarded to the lowest bidder on any article, regardless of whether or not his bid is the lowest on all the articles.

The goods for shipment to the men are packed at the commissary in Nashville in substantial cases and coverings, which are returned promptly and used as long as

Form No. 757

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY

.....Division.

DAIRY ACCOUNT

Requisition for reimbursement for cash expended in the purchase of commissary supplies used for subsistence of my gang during

month of.....192....
Approved:
.....
Division Engineer
Approved:
.....
Chief Engineer.

No. of Men.....No. of Work Days.....
.....
Signature of Foreman.
Address—Care of.....Division Engineer.

192....	ARTICLES AND QUANTITIES	Amount	Total Amount

Foreman will send one copy of this form to Division Engineer with their monthly provision requisition. Division Engineer will make four additional copies and forward original and on copy to Chief Engineer, retaining one copy for his file, and mail two copies to Commissary Agent.
This form to be used for reporting purchases of fresh vegetables, milk, butter, eggs, etc. Purchases of articles listed in the "Ration" which should be ordered on requisition, will be allowed only in case of emergency and special authority for such purchases must be secured from the Division Engineer.

Dairy Account, Form 757

they are serviceable. Invoices are sent by train mail and also packed with the goods. These are checked by the foreman and returned to the division engineer, who O. K.'s and forwards them to the commissary agent.

Perishable goods are forwarded by baggage, others by local freight. The company's telephone is used freely to keep in touch with gangs which are moved unexpectedly. Comparative statements of costs for each gang are made up in the chief engineer's office and blueprint copies sent to all division engineers. It is the duty of the division engineers to note all cases of apparent extravagance or dishonesty of cooks and the commissary agent also calls attention to irregularities.

A lunch club is operated in the purchasing department and the food for it is furnished at cost by the commissary agent. He thus makes a practical test of the quality of all foodstuffs purchased and none are sent out that are not known to be of quality specified and in good condition.

Three months after the inauguration of the plan the balance was on the company's side of the ledger. Advances in foodstuffs and cooks' wages have again run the cost above the price charged. By the experience already gained and training of cooks and foremen, the loss has not yet reached a point where a raise in the board cost is considered imperative. It is hoped that with the advent of lower food costs, notwithstanding recent very heavy advances in cooks' wages, the balance will again fall below the price charged. It is our purpose to feed the men at cost, and when our recent losses are made good and conditions justify, it is expected that the boarding charge will be reduced.

STATEMENT OF BOARDING COST

Bridge Gangs

	1918	1919
Average cost, with cook, per man, per day.....	$0.621	$.618
Average food cost	.452	.407
Man days worked	104,544	84,120

Track Gangs

	1918	1919
Average cost, with cook, per man, per day.....	$.536	$.460
Average food cost	.406	.322
Man days worked	109,159	91,948

Bridge gang, 1918, worked 104,544 man days, loss $0.02 over $.60 per day	$2,090.88
Track gang, 1918, worked 109,159 man days, loss $0.036 over $.50 per day	3,929.72
Total loss	$6,020.60
Bridge gang, 1919 worked 84,120 man days, loss $0.018 over $.60 per day	$1,514.16
Track gang, 1919, worked 91,948 man days, gain $0.04 under $.50 per day	$3,677.92
Net gain	$2,163.76

So far as I know, the plan above outlined of feeding maintenance of way employees is unique. It has many advantages. The men are contented and the gangs are generally full. With present good wages, the quality of the labor will improve greatly. In case of wrecks or washouts, complete outfits are at hand to feed section men and other additional forces who have to be assembled quickly. The meals are furnished promptly, well cooked and served, which is not always the case where the messing system is adopted. The cost is much less to the men than they could obtain by any other method. There is no profiteering on the men, such as may often be the case where they are boarded by contractors or by the foremen. The computed cost for board includes the cook's wages. In many cases on other railroads the cook is furnished at the expense of the railroad where a gang consists of six or more men. Men who are entitled to have their expenses paid while traveling are often fed at the boarding cars at a substantial saving.

THE PROPERTIES OF WESTERN TIE WOODS*

Pacific Coast Forests Are Becoming an Increasingly Important Factor in Railroad Timber Purchases

BY P. R. HICKS†

APPROXIMATELY two-thirds of the standing timber in the United States is in the western or the Rocky Mountain and Pacific Coast states, and with the increasing drain on the southern and eastern forests for tie and other purposes the railroads must necessarily look to the western forests for an increasing proportion of their future tie supply. A knowledge of the properties of these western species, therefore, becomes of importance to railway engineers.

Important properties of wood suitable for crossties include strength or mechanical properties, durability or resistance to decay, and susceptibility to preservative treatment. This article presents data on the suitability of western species from the standpoint of their mechanical properties.

The mechanical properties of ties made from widely used species like the oaks, southern yellow pines, and Douglas fir are in a general way well known. It is, however, desirable to have some means of comparing the strength properties of the familiar species with those that are unfamiliar. A comparison of the mechanical properties of ties involves a consideration of bending strength, which is important in case of center binding; of resistance to spike pulling and lateral pressure on spikes, and of resistance to rail or plate wear. These properties may be studied by making a variety of tests, including impact and static bending, compression parallel and perpendicular to grain, and side and end hardness. For purposes of comparison the available data resulting from many thousands of tests on small, clear specimens of wood, as tested green and air-dry by the Forest Products Laboratory, have been used in compiling so-called "composite figures"‡, which represent the relative strengths for the different species when used as ties. The procedure followed in computing the composite figure is outlined in Table 1, where the available mechanical properties used and the relative weights assigned to each are listed.

The composite strength values for western tie species are shown in Table 2 along with figures on some other widely used species for comparison. A composite figure for redwood has not been determined on account of a lack of test data, although tentative figures for specific gravity, compression perpendicular to the grain, and side hardness have been inserted in Table 2.

A study of these composite figures for the various species shows that all of the tests upon which they are based have the same general trend. Hence, the various strength properties of tie species have the same general relative order as the composite figures. These relations are shown in the diagram for compression perpendicular to the grain, side hardness, specific gravity, and for resistance to withdrawal of nails. Compression perpendicular to grain and side hardness are important strength properties of ties, and the specific gravity and resistance to withdrawal of nails are interesting since they show the same trend as the properties used in computing the composite figure. In fact, specific gravity might be substituted for the composite figures with very little change in the order of strength, and aside from actual tests specific gravity gives the best indication of the strength properties. This determination is simple to make and can be used in connection with the diagram as a means of roughly determining the relative strength value of a given species of timber.*

The chart clearly shows the comparative strength values of various

*This is the first of a series of articles on western tie species.

†Engineer in Forest Products, Forest Products Laboratory, Madison, Wis.

‡See paper entitled "Discussion on Woods Suitable for Crossties," by Carlile P. Winslow and John A. Newlin, in the proceedings of the American Wood Preservers' Association for 1916.

*U. S. Department of Agriculture Bulletin No. 556, "Mechanical Properties of Woods Grown in the United States," lists the strength properties of 126 species of wood. This bulletin may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for ten cents, stamps not accepted.

TABLE 1.—BASIS FOR THE DEVELOPMENT OF A COMPOSITE STRENGTH FIGURE FOR TIES.

Mechanical Property.	Relative Weight Used in Forming Composite Figures.	Relation of Mechanical Property to Use of Species for Crossties.
Static Bending.		These properties involve the strength when used as a beam. They are of primary value in determining the resistance offered to breaking caused by "center binding."
Modulus of rupture	14.3%	
Fiber stress at elastic limit.	7.1%	
Impact Bending.		
Fiber stress at elastic limit.	7.1%	
Total	28.5%	
Compression Parallel to Grain.		These properties involve the resistance offered to a compressive force exerted lengthwise along the grain and are of value in indicating the resistance offered to lateral pressure on spikes.
Fiber stress at elastic limit.	7.2%	
Maximum crushing strength	14.3%	
End Hardness	10.0%	
Total	31.5%	
Side Hardness	20.0%	Indicates the resistance to rail wear, abrasion, etc.
Compression Perpendicular to Grain.		
Fiber stress at elastic limit	20.0%	
Total	40.0%	
Composite figure	100.0%	

COMPARATIVE STRENGTH VALUES FOR VARIOUS SPECIES OF WOOD

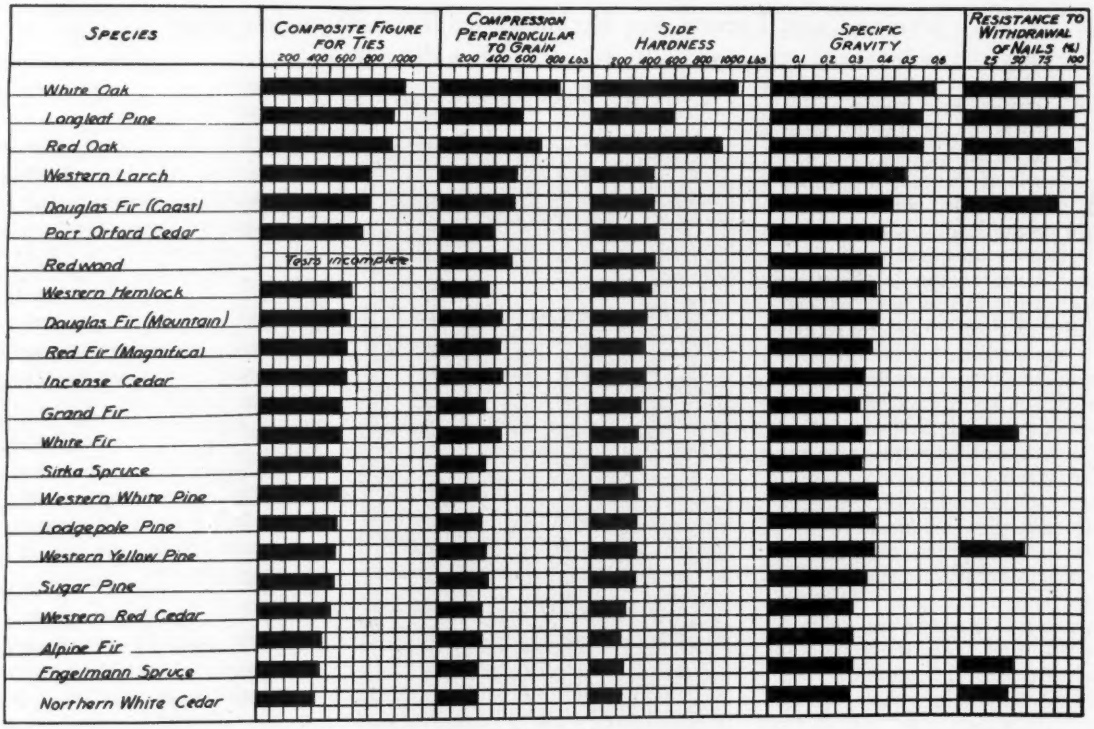


TABLE 2.—MECHANICAL PROPERTIES OF VARIOUS SPECIES BASED ON TESTS OF SMALL SPECIMENS FREE FROM DEFECTS.

Species	Composite Figure (a)	Specific Gravity (b)	Compression Perpendicular to Grain (c)	Side Hardness (c)	Resistance to Withdrawal of Nails
			Lb. per sq. in.	Lb. per sq. in.	Per Cent
White oak	1040	.59	830	1060	100
Longleaf pine	965	.55	600	590	100
Red oak	940 (a)	.56	730	950	100
Western larch	800	.48	560	450	.....
Douglas fir (coast)	795	.45	530	470	85
Port Orford cedar	730	.41	380	480	.....
Redwood	.....	.41	520	460	.....
Western hemlock	670	.38	350	430	.....
Douglas fir (mountain)	660	.40	450	400	.....
Red fir (magnifica)	622	.37	440	380	.....
Incense cedar	621	.35	460	390	.....
Grand fir	595	.37	340	360	.....
White fir	590	.35	440	330	52
Sitka spruce	590	.34	330	370	.....
Western white pine	585	.39	300	330	.....
Lodgepole pine	560	.38	310	330	.....
Western yellow pine	555	.38	340	320	58
Sugar pine	555	.36	350	320	.....
Western red cedar	525	.31	310	260	.....
Alpine fir	470	.31	310	220	.....
Engelmann spruce	455	.31	290	240	49
Northern white cedar	415	.29	290	230	43

(a) The composite figure for red oak is low in comparison with that of longleaf pine on account of its comparatively low strength values in bending.
(b) Based on volume when green and weight when oven dried.
(c) Values for green material.

species for use as ties. Certain of them will invariably rank high; others will fall in an intermediate class, while still others will necessarily be given a lower classification. The species shown are, however, all worthy of consideration as tie material.

In comparing an individual lot of ties of any given species, it should be remembered that the average combined mechanical properties of the lot may vary as much as 30 per cent above or below any composite figure which is representative of the species as a whole. The direction of this variation depends on whether the ties in question are of dense (heavy), clear material free from defects, or vice versa.

CHARRING DOES NOT PRESERVE WOOD*

CHARRING is of little value in protecting the butts of fence posts and telephone poles from decay. This is shown by service tests made by the U. S. Forest Products Laboratory on fences of charred and untreated posts of various species. The charred posts proved in these tests to be even less durable than the untreated ones.

Theoretically, an area of charred wood around a post should prevent decay, because charcoal does not decay or encourage the growth of fungi. But the charred area around a post is not usually a solid covering. It is checked through in many places. If posts are seasoned before they are charred, the charring does not reach to the bottom of the season checks which are always present. If green unchecked posts are charred, checks will open through the charred part as the wood seasons. In either case the uncharred center of the post is exposed to fungus infection and will decay as rapidly as any untreated wood. Charring deep enough to resist decay would undoubtedly weaken a post of ordinary size.

*Technical Note 108, Forest Products Laboratory, U. S. Forest Service, Madison, Wis.

A MEASURE OF SIZE.—The Pennsylvania System is now serving a population of more than 52,000,000 people in 14 states, or approximately 48 per cent of the population of the United States. The Pennsylvania System now traverses 11,967.86 miles of territory in these 14 states, but the actual trackage covers nearly 2½ times this number of miles.

MAINTENANCE PAINTERS MEET AT DETROIT

Permanent Forces, the Feeding and Housing of Men and Economy in the Use of Tools Form Principal Subjects of Discussion

THE seventeenth annual convention of the Maintenance of Way Master Painters' Association was held at the Fort Shelby hotel, Detroit, Mich., on October 5-7, inclusive. In accordance with the established purpose and traditions of this organization, the meeting was devoted to a discussion of the methods and practices of the painter's craft as applied to maintenance of way and structures, economy in the handling of tools and equipment, the use of motor cars, the housing and feeding of workmen and the possibility of keeping men employed the year round. Other matters, presented in the form of reports, papers or informal discussions, concerned various other phases of the trade.

The officers of this association during the past year were: President, H. F. Jones, master painter, Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind.; first vice-president, H. B. Wilson, master painter, Bessemer & Lake Erie, Greenville, Pa.; second vice-president, B. F. Darrow, master painter, Atchison, Topeka & Santa Fe, Kansas City, Mo.; secretary-treasurer, E. E. Martin, master painter, Union Pacific, Kansas City, Mo.

The meeting was called to order at 9:30 on October 5 by President Jones, who gave a brief address acknowledging the gratitude of the association to those who had made the meeting possible. The report of the secretary-treasurer showed a membership of 90, an increase of five over the past year. The financial statement showed receipts during the year of $365.84 and expenditures of $274.75, with a net balance of $91 in the treasury.

One of the most interesting features of the convention was a round table discussion of questions submitted by members relating to common every day problems of painting. The attendance at the sessions averaged about 35.

The Painting of Steel Bridges

TWO speakers discussed the painting of steel bridges, one from the viewpoint of the engineer, the other from the position of the practical painter. Abstracts of both of these discussions are presented below, together with oral discussion on the floor of the convention.

BRIDGE PAINTING FOR A THIRD OF A CENTURY

CHARLES E. FOWLER, consulting engineer, New York City, presented some general observations on the subject of metal bridge painting based on his experience over a period of 33 years. Knowledge of the painting of bridges developed with the advancement of bridge engineering. The introduction of structural steel introduced new problems because of the far greater tendency of steel to corrode. The presence of a mill scale which tends to flake off after a time is one of the difficulties encountered in steel bridges, which no doubt is the reason why many English specifications provide for the erection of the bridge without any paint coating until the scale has an opportunity to come off. One advance in painting technology is the development of paints that will absorb the surplus oxygen in rust and thus effectively stop the corrosion. Such paints must be protected with a waterproofing coat.

Mr. Fowler also discussed the cleaning of old paint surfaces for repainting and favored the sand blast. This was used on the Niagara Gorge arch, using a local sand that had sufficient grit in it to be effective. Difficulty was encountered in having the painters do this work so it was finally turned over to the bridge erecting forces. This work cost about one cent per square foot, or about double the cost of ordinary scraping and wire brushing. In his opinion it is unnecessary to remove all the old paint if portions of it are still in good condition.

As an illustration of the selection of protective coatings for the purposes for which they are best suited, the speaker said that twelve kinds of coverings were used in the recent reconstruction of the arch bridge. These included Tockolith for spot painting the rusted places, two coats of white lead and zinc (silver gray shade) over the entire main structure. Hermastic enamel on the upper side of the copper steel deck, graphite on the underside to resist gases, red lead and lamp black on the new steel reinforcing, Galvanum paint on galvanized iron down spouts, turpentine asphaltum on the inside of bridge floor drain pipes, cement paint on cast iron column bases filled with concrete, gunite (cement gun) on the abutments and Carbolineum on bridge floor timbers.

EFFICIENT PAINTING AND COATINGS FOR STEEL STRUCTURES

By Henry Crooks

Master Painter, Pittsburgh & Lake Erie, Pittsburgh, Pa.

IT IS a common impression or idea that any handy man who can climb is good enough for painting steel, but it is a mistake. I claim from practical knowledge that men must be skilled in safe rigging and good cleaning, and this is where the maintenance of way painter excels over all other painters. He has the patience and skill to clean his work thoroughly before coating and it is here that the company painter shows his efficiency over the contract painter, for I have never seen a commercial painter who would not shirk at cleaning rust off steel nor will he paint as well. He is all right on open surfaces, but when you examine pin joints and boxes you will find them

slighted. Other details will not receive proper attention.

I am a firm believer in the removal of mill scale. It has been claimed that the scale acts as a filler and protects the steel, but the simple test made by taking two pieces of steel, one with the scale intact, the other with scale removed, and coating each with red lead filler and weathering them, will show in a few months that the piece with scale intact will be badly corroded, while the piece coated with red lead will be good for two years after cleaning. Some will say: "But don't you coat the scale with red lead?" I say: "Yes, but you are working over a poor foundation." I have heard complaints that steel with the scale removed has deteriorated just as quickly, but this can be traced to poor cleaning. Again, it is said where the scale is removed it leaves a rough surface. This also is a benefit, for when you apply your filler it not only has the adhering quality, but dovetails to the steel as well.

For painting new steel one cannot improve on the old three coat specification of a priming coat of red lead, a second coat of 50 per cent red lead and 50 per cent selected finishing paint, and a third coat of finishing with a selected paint. Under the supervision of a practical foreman who requires his men to clean and paint in a workmanlike manner, these will give good results.

THOROUGH CLEANING ESSENTIAL

When is steel properly cleaned? When all rust, grease and dirt have been removed. What are the best ways to complete this job? It depends on the situation. Where a sand blast can be used it is the most efficient, but the most common practice calls for scrapers, chipping hammers, bars and steel brushes with good men behind the tools. I have used and found practical the application of both water and oil. Both frequently effect a saving of labor. A man can clean three times more of the oil coated rust than the dry. I have also burned off paint and it was a slow process, but with the coming of the flare torch it ought to be possible to burn off the paint at a very small cost.

Good painting rests two-thirds with the man and one-third with the paint. You can trace many a poor job to inexperienced help. Merely laying on or covering surface is not painting. Too many men use the straight stroke, never crossing their work before sweeping off, though it is only by this method that one can get an even film.

After cleaning and touching up the work ready for a coat all over, I would recommend less pigment and more oil in the paint for the following reasons: The top of the old film having worn away leaves the particles of pigment exposed. The life of the oil with which the pigment is saturated has weakened. The particles will take up the excess of oil, giving new life to them and form a perfect bond. If a second coat has to be applied give a good body coat. Every structure that is to be refinished has its own problem and it is only by getting on the job that you can solve it.

PIGMENTS

It is hardly necessary for me to mention red lead for the first or shop coat, but we should insist that it be pure and mixed with good linseed oil. Too many shop coats have a big percentage of substitutes mixed with inferior oil, with the result that when the field coats are applied, it does not form a perfect bond. Many a good paint has been condemned because it was applied over a poor foundation.

Oxide of iron when properly prepared has no tendency to oxidize the oil with which it is ground, but allows the paint to dry naturally, forming a tough, elastic, durable coating which adheres so tenaciously to the surface as almost to form part of the structure itself. It conforms perfectly to expansion and contraction due to heat and cold without any tendency to chip, crack or scale.

Graphite of a good quality is indestructible as a pigment when mixed with good linseed oil. Resisting the action of acids and gasses, it forms a film that expands and contracts with the steel in all kinds of weather. Some painters claim it corrodes the steel, but we are agreed that the first coat is red lead. It forms a skin between the graphite and steel, preventing chemical action, if there is any. I have had a job treated in this manner under my observation for over twenty years and there has never been a rust spot. This work is given one thin coat of a good carbon graphite paint every three years. Carbon and gas blacks can be classed among the best pigments for steel structures. They are durable, tough and elastic under all reasonable conditions.

Other coatings which I have used with good results are: pure lamp black; 50 per cent lamp black and 50 per cent red lead; 75 per cent carbon black and 25 per cent red lead; 25 per cent carbon black and 75 per cent oxide of iron. I have had very little experience with pitch products on steel structures and what I have used have not stood the test when exposed, but from inquiry I have found many painters who have used special formulas with a pitch base with good results. Any reliable paint manufacturer can make a reasonably good paint with the pigments mentioned above and good linseed oil.

It may be said that the quicker a paint dries and becomes hard the better, but it is essential that the rapidity of drying will not interfere with the elasticity of the surface. In many cases the deterioration of a paint after being on a few months can be traced to an excess of dryers or dryers of the wrong kind which are liable to decompose the oil, although it is necessary that the paint shall dry off hard. It is important that the dried skin shall be sufficiently elastic to be capable of resisting any exposure to which it is subjected, such as air, heat and moisture. Perhaps the worst fault that a paint can have is that of cracking when exposed to the elements. This should be sufficient to condemn the cheap paints now so freely offered. A worthy paint must have sufficient body to give a good coat and yet not be so thick as to drag on the brush.

DISCUSSION

The discussion of this paper was limited to practically two phases of the subject, namely, cleaning the metal surface and special protections for locations subjected to gaseous fumes or brine drippings. B. E. Darrow (A. T. & S. F.) recommended the use of black oil to soften rust to be removed. This practice was also favored by M. S. Ebel (B. & O.), while John Corder (P. M.) recommended kerosene.

In speaking of the inability of ordinary paint to resist the action of brine dripping, H. S. Bird (P. & R.) reported considerable success with the use of a special body roof paint containing asbestos fiber, which material is put on cold in a rather heavy coating, requiring the use of one gallon of the material for 100 sq. ft. C. W. Blundell (M. K. & T.) stated that he had obtained considerable success with the use of waste oil taken out of ditches at fuel oil stations, while H. B. Wilson (B. & L. E.) used oil with the admixture of carbon and crude oil with the paint recommended by Mr. Bird.

The superstructures of coaling stations, particularly the iron work immediately over the tracks, had given a great deal of trouble, and H. E. Conrad described the service secured with a proprietary compound applied three years

ago that is now giving excellent service. This is a soft, plastic material which never dries hard and has an unsightly appearance so that it is of service only in special conditions. Two elements for the success of this is that the metal surface must be thoroughly clean and the material must be applied hot. Mr. Crooks said that he secured excellent service from a test specimen of the same material placed in a smoke jack.

Tools and Equipment Practice

TOOLS AND equipment were discussed under several heads, of which the most important concerned the economical use and care of the more common tools used by painters. Motor cars and the paint spray were also discussed.

ECONOMY IN HANDLING TOOLS

By CHARLES K. COLLENBURG
Division Paint Foreman, Union Pacific, Cheyenne, Wyo.

ONE OF THE most important items in use by maintenance of way painters, both in cost and the requirements of frequent inspection and care, is the ropes and blocks used on the different structures to be painted, cleaned or repaired. While in use the utmost vigilance must be displayed and care exercised that no parts or strands are exposed to heat severe enough to burn or char, to acids that may corrode or rot the fiber, or to dirt, cinders and gravel that can be avoided, for such things are the cause of accidents and frequent renewals. Unnecessary exposure to weather and winds that whip the ropes against each other or against buildings or structures is another cause for decay and destruction, and should be avoided whenever possible.

H. F. Jones
President

When not in use, ropes should be protected from dirt and grit and hung up on the walls of the shop or tool car in such a way that no chafing of rope strands against sharp corners or projecting nails can take place. Many painters advocate the storage of ropes when not in use, in boxes or barrels. This practice tends to the formation of mildew. It also gives a splendid opportunity for anxiety as to the condition the ropes will be found in when next needed. When hung on large wooden pins, bars or saddles, and in such a position that they are under daily observation, the blocks and ropes have a better chance to be kept in proper condition. It has been the usual practice among most painters to coil their swing lines in a single strand or to pull their ropes to their full fall length and coil them in quadruple strands. A good method is to use the four-strand method, but instead of coiling to loosely interlace or braid them, thus reducing the length so that the ropes can be handled easily and hung over the pins, bars, or saddles used for that purpose. Where ropes are in frequent use this method will be found to be a great time saver compared to the ordinary coiling method and its almost inevitable entanglements. Hand-lines, slings, and short lengths of rope should be coiled neatly and cared for, as it is almost as important to care for these as for the main ropes.

The blocks should be lubricated when necessary and for this purpose dry graphite is recommended in preference to oil, as all oil lubricating invites retention of dirt and grit in the rope strands and this is always detrimental to the rope. The blocks should also be painted or varnished frequently enough to retard rust in iron blocks or decay of the wooden blocks. Various kinds of wooden ladders, extension, steps and lean-to, swing stages, wooden roof jacks, trestles, working planks, and all other equipment in which wood is mainly used in construction should be given the best of care and attention.

The indiscriminate driving of nails in equipment of this kind is the cause of many accidents and is responsible for the necessity of many renewals of equipment of this character. Every unnecessary nail driven in a ladder or trestle is a source of weakness, and a potential cause of accident. Aside from the direct damage done to the equipment, and its tendency to diminish its usefulness and life, such practices should be abolished when in vogue and always avoided on the principle that it is antagonistic to all the precepts of "Safety First." Many men have been thrown from a scaffold or ladder because some unnecessary projecting nail caught in loose clothing or against some tool. Again, it occurs too frequently that a man permits an extension or other ladder to crash to the ground with such force that a wood fracture takes place that will perhaps not be discernible until a complete break develops and an accident occurs to the next user.

The care of iron roof and bridge hooks, brackets, swing slings, ladder jacks, and other metal equipment is easily accomplished by storage in a dry place, protected from the weather when not in use and an occasional cleaning and coat of paint when necessary to protect them from rust or corrosion. Rough handling of equipment, whether of iron or wood, should be discouraged at all times. It is just as easy to form the habit of letting things down with a hand-line as it is to throw them from the top and endanger those below or possibly cause injury and breakage to other tools or the structure on which you are working. It should also be one of the first duties of the foreman in charge to make a personal inspection of all tools and equipment that are used by his men and have immediate repairs made to any that show the need for same. If there is not enough mechanical ability among the men employed to make the proper repairs on tools when damaged, the foreman should send them to be repaired to their proper destination or be empowered to employ some one capable of making such repairs.

When the question of economy in brushes confronts the master painter, undoubtedly we all have our own ideas. Notwithstanding the idea that prevails among quite a

few of us that the old-fashioned round brushes and round sash tools are the most economical, it remains a fact that as far as the present day painter is concerned he knows little or nothing of the "breaking in" or care of this class of brushes. At the present time, where one round brush is in use, thousands of flat brushes are in the hands of excellent painters with which they are doing fine work. It can safely be said that 90 per cent of all paint and varnish applied at the present time is being applied with flat brushes, and the deplorable fact remains that it is being well done. The flat brush is more easily and rapidly cleaned than the round brush, owing to its shape and inability to carry the same amount of color. Brushes of all descriptions made from bristle stock should be suspended in oil after using in paint, and in thinned varnish after using in that vehicle. This, of course, applies to brushes that are in constant or frequent use. A good method of keeping a brush soft for an indefinite period is to cleanse it in gasoline, benzine, kerosene or turpentine and then dip in lard oil, working the lard oil well up in the heel of the brush, then wrapping it tightly in oiled or waxed paper and laying away. If proper care is taken to insure that brushes are carefully spread, they will be found ready to use after rinsing out the lard oil in gasoline or benzine. Brushes used in shellac or alcohol lacquers, which should be only those set in glue, should be suspended in thinned shellac or lacquer when not in use. If they should get hard, suspension in alcohol will soften them.

Experienced painters will do more work with far less brush cost than inexperienced or amateur brush hands can do owing to the fact that the experienced artisan uses his brush so that less pressure is brought to bear on the heel and also that only the proper pressure is used to exude the amount of paint necesary to do the work. This ability, which is only possessed by the real artisan in this kind of work, is hard to describe technically, but it is easy for the discerning eye of the master craftsman to detect the lack of experience the moment the novice takes hold of the brush.

The great problem that confronts us when we consider the present cost of all kinds of brushes, is how to get the best results from their use, and how to impress on the minds of our men the importance of using a brush so that it will give its full service before it is discarded. The well worn and properly handled brush is always evident by its uniform wear and clean appearance and anyone showing carelessness in looking after such tools, even when well worn, should be rebuked instantly, and if necessary disciplined.

To allot a certain set of brushes to each man, and hold him responsible for their condition and care, is the usual custom in many establishments where painters are employed, but this is almost impossible at times where the class of work changes from interiors of large terminal stations to bridge and tank work, or when the store department suffers from its chronic complaint, "shortage of brushes." It is far easier to provide brushes to each man and hold him responsible for their condition than to have a number of men complain of the condition of the brushes assigned to them and blame everybody else for that condition. It is also indisputable that giving each man a set of brushes and holding him accountable for their preservation and condition tends to reduce the brush cost per man and also gives the foreman an opportunity to correct any abuses that prevail in the use and misuse of such tools. When conditions do not permit us to do these things as we believe they should be done, it behooves us to do the next best and supply our men with the brushes that are used in common and issue to each the tool he is best able to do the work to which he is assigned and insist on him giving the same care and attention to this class of brushes as he would to those assigned to his personal use.

Most painters' tools, as sign writers' brushes, striping pencils, gilding tools, graining brushes and combs, and other graining tools, paper hangers' shears, dry brushes, seam rollers and trimming knives, are bought and paid for by the users and they do not want to use or take care of tools that can be taken from them at the behest of anybody who has that authority. This also applies to dusters, putty knives, scrapers, pot hooks, glazing chisels, glass cutters, etc. It is customary that recognized painters provide most of such tools when seeking work in the commercial field, and the practice should be encouraged among those who are now employed or are seeking employment among maintenance of way painters.

A proper check on tools used by maintenance of way painters is made in different ways and by different methods. The regular inventory of tools informs us of what is there and what is missing. A card check system, charging out all brushes and tools loaned to other departments or released to them, and giving them proper credit when returned is sufficient in many instances to insure the return of the tools. It is too often the case, however, that ladders, brushes or other tools are loaned to other craftsmen and returned in such a deplorable condition that they are worthless for any purpose thereafter. The loaning of such tools should be discouraged at all times, and when a real necessity exists and such loans are negotiated it should be insisted on that all tools be returned promptly and in good condition, or that replacement be made by proper authority.

When the present high cost of tools and equipment is considered, along with the appalling indifference usually displayed by the ordinary employee as to that cost, it should be the duty of every supervising foreman to acquaint himself with the actual cost of each brush and tool that is issued to him and see that a bulletin is posted with this information in the shop or car. For the mutual benefit of other employees and the company as well, this bulletin should be renewed every month and if it would also carry the cost price of the standard materials in every day use, it should impress each employee with the full importance of his duty to the railway and to himself to avoid any unnecessary waste of material or to misuse tools and equipment in such a way that unnecessary expense is incurred to maintain them in good condition.

DISCUSSION

The interest in this paper centered around the care of brushes and the proper use of ropes. A discussion of the relative merits of round and flat brushes indicated that the former has become almost obsolete, very few painters in this day being able to use them properly. On the breaking in of new brushes, H. E. Conrad (P. R. R.) favored their use on priming to start, placing them in water over night, if the weather was hot and in oil if cold. H. B. Wilson (B. & L. E.) said new brushes had a tendency to spread at the ends, so that he found it necessary to lay them out on a board at night with the ends of the bristles held close together until they would take that position naturally. He also said that fiber brushes could be made stiff by dipping in varnish and exposing to the air with a part of the varnish still in them. After speaking of the indifference of many painters as to the condition of their brushes, M. F. Ebel (B. & O.) advocated assigning one reliable man to the duty of caring for the brushes at the end of the day's work.

The discussion of ropes centered largely around the necessity for keeping them in the possession of the gang.

Ropes loaned to other departments are likely to come back in poor condition, H. S. Bird (P. & R.) told of loaning a rope to a gang cleaning glass in a train shed and that when it came back it was found to have been burned with the acid used in cleaning. He said overstraining will cause an equally dangerous condition.

SOME SUGGESTIONS ON SPRAY PAINTING

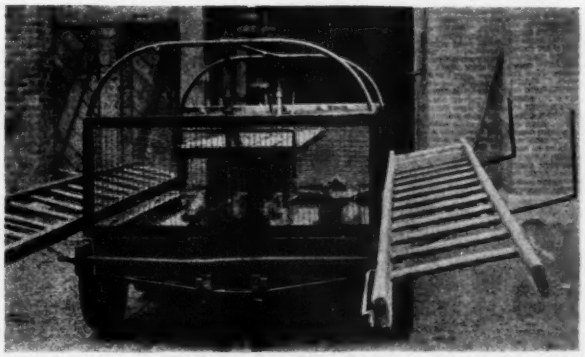
By C. B. LYONS

The De Vilbiss Manufacturing Company, Toledo, Ohio

THE PROGRESS made by paint spraying equipment in the last few years, especially in the structural field, should be of interest to all. There was some question as to the feasibility of using it on exterior wood surfaces, but after considerable experimenting spray painting is advocated for small structures, such as houses and the like, and although painting in this field is still in its infancy, the tests conducted are convincing proof of its practicability.

In large structural work the saving in labor and time are the prominent features. The work is done at the rate of 500 sq. ft. and upward per hour, or in one-fifth the time required by brushing, thus increasing the output and efficiency of the gang. These figures apply equally to the application of mill whites, calcimines, lead and oil paints for interiors and to mineral and lead and oil paints for exteriors. The waste of material is small, for while running in some cases to 10 per cent, the average will be found to be less than 5 per cent. The paints used are generally of the same consistency as for proper handling with a brush.

When using spray equipment on exterior surfaces of wood, care must be taken not to apply too heavy a coat. Best results are obtained with paints ranging from 12 to 15 lb. per gal. Ready mixed paints or lead and oil

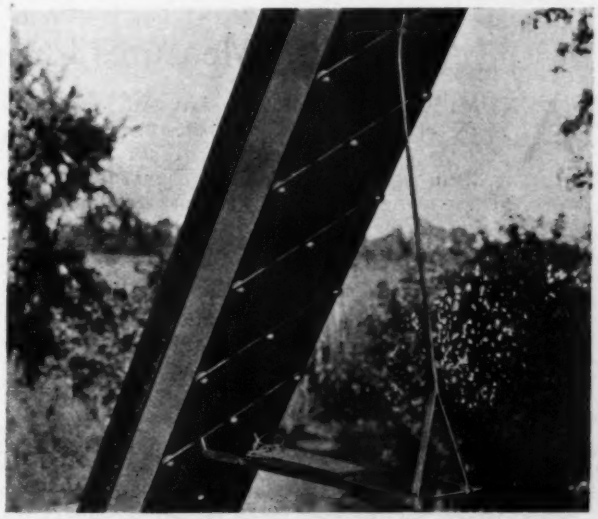


How to Carry Ladders on a Motor Car

This plan removes all obstructions from the platform of the car, thus giving room for the men in proper position before starting, and prevents men from running alongside the car to start it.

mixtures should be reduced to this consistency. Small trim on two-color work is done with the brush.

Speed combined with quality is the aim of spray equipment manufacturers. A speed of 500 sq. ft. per hour is very conservative under working conditions. Cases have been reported where on certain classes of work as high as 2,000 sq. ft. per hour had been covered in one hour. The waste depends entirely on the operator. Using higher air pressures than are actually required and holding the spray at an improper distance from the work are factors causing the waste percentage to rise. Just enough air pressure should be used on the material to cause it to flow freely through the hose to the spray. When working on the ground a pressure ranging between 5 and 10 lb. will be found sufficient. To this should be added approximately a pound of pressure for each foot in height. Too much pressure on the paint will force more material to the nozzle than can be atomized properly, resulting in sags and unnecessary waste of material. Proper pressures for atomizing paint are difficult to specify, but on the usual run of paints it should be 40 to 50 lb. More pressure than is actually required to atomize the paint thoroughly causes excessive vapor.



The Safety Bracket Batter Post Hanger

It is not only safe, but gets the painter up to his work where he can see what he is doing, and when he arrives at the bridge the man has no excuse for not starting to work immediately.

The work should be done with as low air pressures as possible.

The proper distance for holding the spray from the surface is six to eight inches. To avoid complications paints, when used with spraying equipment, must be properly strained. Any paint from cold water to red lead can be sprayed successfully. Always specify the kinds of paints to be sprayed when ordering spray equipment. To have an efficient machine, one that responds when called into service, it must be given attention.. Cleaning and oiling are important in the life of spraying equipment.

An exterior spray coat is as lasting as a brush coat. This has been clearly demonstrated by tests conducted on residences by one of the leading spray manufacturers. Brick, concrete, steel and wood exterior surfaces spray-coated have stood the test of time as well as brush-coated surfaces of like nature.

SAFE PRACTICES IN USING EQUIPMENT

MOTOR CARS for maintenance of way paint gangs received enthusiastic approval from all the members. The rapid transportation afforded results in a great saving of time for crews doing right-of-way or sign work and avoids tying up men on dead time when doing station work on lines with poor train service. Two members, H. B. Wilson (B. & L. E.) and C. W. Blundell (M. K. & T.), described outriggers or brackets placed on the cars to carry staging ladders on either side. E. E. Martin (U. P.) favored a trailer to carry tools and equipment, but Mr. Blundell thought it safer to put all of the load on the motor car and said no trailers were used

on his road. Mr. Martin found the cars very reliable of operation but said it is best practice to have one man responsible for their care and operation.

In answer to a suggestion that painters' cars, being usually loaded heavily, entailed the exercise of care in clearing trains, a number of speakers enumerated the precautions taken. President Jones said that the rule on the Big Four was for the man on the car to call the dispatcher from any telephone booth to get a line-up. Men operating cars are instructed as to the proper manner of making such requests of the dispatchers. He said that a speed restriction of 25 miles is enforced under all circumstances and of 10 miles through switches and in terminals. Mr. Blundell said his road placed a speed limit of 10 miles per hour on all cars loaded with materials and that cars were expected to be flagged around curves. John Corder (P. M.) favored a more extended promulgation of definite rules for operating cars safely.

C. W. Blundell (M. K. & T.) demonstrated a number of safety devices which he had put into use for safeguarding the men while painting and displayed a number of photographs illustrating these devices.

Measures for Improving Labor

A NUMBER of the subjects discussed related directly or otherwise to the betterment of labor, such as attracting a better class of men, safeguarding them against accidents and improving their work. These matter all received the undivided attention of those present for no small portion of one of the sessions.

OPERATION AND MAINTENANCE OF CAMP CAR OUTFITS

C. P. Eldridge, master painter, Louisville & Nashville, Madisonville, Ky., prepared a paper describing the hardships experienced by foremen and crew when attempting to do right-of-way and station painting in a sparsely settled territory with no other living accommodations than such that could be obtained among the residents of the territory. A later experience with a camp car outfit convinced them of the advantage of proper accommodations for the men when carried out under the system he followed. Some of his conclusions are given below:

"I have found it possible to take care of 16 men with less trouble than it used to be with 10. The organization is more intact and everyone apparently satisfied. Under the existing high prices of food, the actual living expenses of my men are below those of 1913, when we had to board out. We get a better assortment of food on an average and sleeping conditions are equally good. We have more time for rest and recreation and more privacy with generally better living conditions.

"On account of wishing to make this plan as attractive as possible to the men and in order to maintain a good working force. I decided upon a slightly different scheme than generally employed. My idea was to keep a strict account of all expenditures and charge each man what it actually cost to feed him, thereby eliminating the old grudge against the foreman operating a hotel for profit. This plan has proven very acceptable to the men and is no more trouble to the timekeeper than charging them a fixed amount daily."

Following the reading of this paper various members described the systems followed on their roads for housing and feeding the men. This disclosed a wide variation in the manner of handling this necessary feature of the employment of a gang on road work, the principal methods employed being as follows: (1) Railroad company supplies the cook and the car and equipment, the cook being carried either on straight salary or with additional compensation for increased size of gangs, the cost of the food being prorated among the men according to the number of meals served. (2) Men fed by contract, which in the case of the small gangs such as are employed in maintenance of way painting, is easily arranged for by the employment of a man and wife, the former a member of the crew and the latter as the cook, the men being charged a fixed amount for each meal. (3) The men board themselves and do their own cooking, the selection of the cooks being determined by rotation or more often by natural selection of the men best adapted to do this work. Railway regulations usually require that all cooking be done outside of the regular working hours, so the men often arrange to eat a cold lunch at noon.

From the testimony presented by the various members, it developed that meals served by contract ordinarily cost the men from 40 to 50 cents, whereas meals served on the co-operative basis, with the cook furnished by the company or by one of the men in the gangs, cost from 22 to 30 cents each. The general testimony indicated that the co-operative plan was most favored by the men and that the necessity for employing a cook depended upon the size of the gang.

EMPLOYMENT OF MEN THE YEAR ROUND

One of the matters most actively considered before the convention was the round table discussion of the feasibility of keeping gangs employed the year round as a means of attracting a more efficient type of workmen. Most of those who spoke on this subject testified to reductions of force of from 25 to 40 per cent during the winter months, which under present circumstances afforded them a means of eliminating the less efficient men or those who, while able to do rough outside work, were not suited to doing the interior finishing commonly held over for the winter months. C. W. Blundell (M. K. & T.) described the manner in which the peculiar advantage of the north and south line on which he is employed makes it possible for him to employ his forces on the northern end of the road in the summer months and on the southern end during the winter. J. T. Lewis (Wabash), C. K. Collenberg (Union Pacific) and others agreed that the class of men which it was possible to employ for the summer months only is far less efficient than those that were retained on the force the year round. L. Hornbuckle (Wabash) and H. E. Conrad (P. R. R.) reported that they made no reduction in their forces during the winter months; in fact Mr. Conrad, who has a large amount of building work, employs a larger force in winter than in summer.

Another point developed in the discussion was that a number of those present preferred to do outside painting in the winter than in the hottest summer weather—that is, barring metal bridges, which are so frequently covered with a film of moisture in cold weather so that there is serious danger of poor results. One objection to this idea was raised by E. E. Martin (U. P.), who stated that the windstorms experienced in Kansas during the winter interfered very seriously with outside painting.

The question was also raised as to the efficiency of the men in cold weather as compared with summer on account of the time that would be occupied in going in-

doors to get warm. N. R. Nelson (C. & N. W.) said that in the dry cold weather of his territory (northern Wisconsin) his men did as much work in winter as in summer. Some were inclined to confirm this idea, but the opinion was not unanimous.

E. Louis Ireton, chairman of the International Trade Development Committee, presented a lecture illustrated by stereopticon slides describing the methods being secured in various parts of the country in the teaching of trades in industrial schools. This should be differentiated from the manual training commonly taught in high schools, which has only an academic significance. The great need at the present time is the development of apprentices in the various crafts.

Other Features of the Meeting

THE program included a number of discussions on paint technology and practical problems of the master painter in addition to those reported above. Some of these were presented in formal papers, others were covered in general discussions.

INTERIOR WALL COATINGS

R. L. Hallet, National Lead Company, New York City, explained the theory of interior flat wall coatings. Surface finishes are glossy or flat, depending on whether they reflect light direct or diffuse it. Diffusion takes place when the surface is slightly rough so that the light striking at a given point is reflected at many angles. In paint, the rough surface is obtained by using a large proportion of pigment and a large proportion of volatile vehicle, so that when the latter evaporates there is not enough of the non-volatile vehicle left for the pigment to be entirely submerged in it. Consequently, the pigment particles project in an irregular manner, producing the roughened effect. The discussion of this paper was largely concerned with the cause of spots in the surface that appeared more glossy or flatter than the rest, which was generally ascribed to lack of uniformity in the consistency of the paint or lapping or improper condition of the surface, such as excessive porosity, etc.

FROSTING GLASS

The subject of frosting glass in office windows as a substitute for window shades or for other reasons was introduced in a short paper by L. T. Hornbuckle, master painter, Wabash, Decatur, Ill., who described the use of a green paint on the upper sash of windows. This was a success as far as its use was concerned, but the paint would give only about a year's service on the glass. C. K. Collenberg (U. P.) said that more lasting results can be secured by putting the paint on the outside. He has secured two or three years' service in this way and finds this method cheaper than buying shades. However, he believed sand blasting the glass to get a diffused light was better than painting, but if a paint coat is desired it can be made to hold better if it is applied to a sand-blasted surface. H. B. Wilson (B. & L. E.) reported better results if the glass is taken out and the work done in the shop, whether sand blasting or painting. The secret of painting on glass, he said, was to get the surface clean of grease by using alcohol and pumice. Several others reported their experiences but none had secured much more than a year's life on the inside surface of windows, and Martin Kane (D. & H.) questioned whether it would not be much more satisfactory to buy commercial ground, frosted or ribbed glass than to attempt alterations of plain glass. It was decided to carry the subject over for another year.

QUESTIONS AND ANSWERS

In accordance with the usual practice of this association, the program included the putting and answering of questions concerning the more intimate details of maintenance of way painting. The following were some of the matters discussed:

The whitewashing of cattle guards and other right-of-way features by the section foreman was discouraged as entailing the issuance of a wasteful amount of equipment. In case this work is to be done by the section gang, the use of a prepared cold water paint was recommended as more practicable than the mixing of whitewash by the foremen themselves.

For the proper cleaning of brushes to be stored away, it was recommended that the brushes be cleaned of paint or varnish as thoroughly as possible and set in varnish remover over night, after which they should be washed out with soap and water and dried thoroughly. Some stated that this led to difficulties because the varnish remover would attack the glue that the bristles were set in, causing the bristles to become loose. Others favored the use of turpentine or gasoline, followed by a solution of soda ash and clean water, while some preferred saturating the brush thoroughly with grease or a non-drying oil.

The question of glazing in roundhouses, owing to the poor service given by putty, led to the discussion of a proprietary compound or cement designed for use as a substitute for putty in such locations.

The economical painting of cast-iron roadway signs brought out several methods. H. S. Bird (P. & R.) described the use of a wash ringer roller covered with a piece of car seat felt and equipped with a handle. After the sign had been given a coating of the background paint, this roller would be rolled on a board covered with the letter paint and then over the raised letters of the sign.

The treatment of stenciling paper for the purpose of securing longer life led to the suggestion of several formulas, including one consisting of a coating of equal parts of paraffin and linseed oil. One member stated that he secured the best results by pasting cheesecloth on one side of the stencil.

ELECTION OF OFFICERS

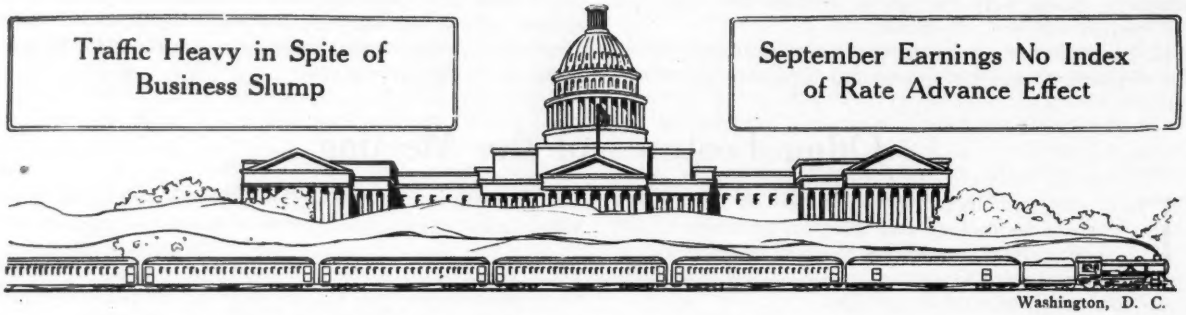
The officers elected for the ensuing year are: President, H. F. Jones (re-elected); first vice-president, P. F. Darrow, master painter, Atchison, Topeka & Santa Fe, Kansas City, Mo.; second vice-president, H. F. Bird, master painter, Philadelphia & Reading, Philadelphia, Pa.; secretary-treasurer, E. E. Martin (re-elected). Buffalo, N. Y., was selected as the place for the holding of the next convention on October 4-6, inclusive, 1921.

The Railway Supply Men's Association, composed of representatives of the Carter White Lead Company, Chicago; the Detroit Graphite Company, Detroit, Mich.; the De Vilbiss Manufacturing Company, Toledo, Ohio; the John Lucas Company, Chicago; the Patton Paint Company, Milwaukee, Wis.; the Sherwin-Williams Company, Cleveland, Ohio; and the Wolf Brush Company, Pittsburgh, Pa., presented an informal display of catalogs and other descriptive literature, samples of paint coatings and paint materials in the convention room. On Wednesday evening the welfare committee of this organization tendered the members and families of the Master Painters' Association a banquet in the dining room of the Fort Shelby hotel.

RAILWAY AFFAIRS AT THE NATION'S CAPITAL

Traffic Heavy in Spite of Business Slump

September Earnings No Index of Rate Advance Effect



Washington, D. C.

ALTHOUGH a considerable falling off in the volume of railroad traffic has been experienced recently, statistics compiled by the Interstate Commerce Commission and by the Car Service Division of the American Railroad Association indicate that the year 1920 will still break all records for the amount of freight transported by the railroads in a year, while many of the statistical units which measure the efficiency of transportation performance have already broken previous records. For November and December comparisons are to be made with a period in which a sharp falling off in business occurred both in 1919 and 1918 and the reports available up to November 6 show a freight tonnage unparalleled in railroad history.

For the first eight months of 1920 the net ton miles of freight handled aggregated 291,053,000,000, as compared with 248,819,000,000 in the corresponding period of 1919, 288,380,000,000 in 1918 and 283,486,000,000 in 1917. In July and again in August the number of ton miles was greater than for any previous month. The ton mile statistics are not yet available for later months than August, but the weekly car loading reports received by the Car Service Division show that for the 10 weeks ending November 6 the number of cars loaded with revenue freight was 9,684,453, as compared with 9,493,354 in the corresponding period of 1919 and 9,354,336 in the corresponding period of 1918. For three weeks in October the car loading was in excess of a million cars a week and in the week of October 23 it was 1,010,961, but in the week of October 30 it fell to 973,120 and in the week of November 6, which included election day, to 910,592. These figures reflect some of the depression in industrial activity, which has been reported for some time, and also the fact that the peak of the grain movement was somewhat flattened by the tendency of the farmers to hold wheat, but as the figures are still above those for the corresponding period of 1919 and 1918 the general reduction in loading thus far reported is hardly more than seasonable.

Meanwhile the car shortage, which on September 1 amounted to 147,309 cars, has been steadily reduced until for the week of November 5 it was only 39,688, and there were surpluses in parts of the west amounting to 12,033 cars.

This volume of freight has been handled only by a greater degree of efficiency, in the effort to make each unit of the railroad plant perform a greater service than ever before. The average freight car during August carried a load of 29.8 tons, as compared with 28.0 in August, 1919, and 29.6 in July, 1920. This average was greater than was attained in any month of 1919, but it was exceeded in July and August, 1918, when the average carload was 30.1 tons, and equalled in December, 1918. The average freight train load in August was the highest ever recorded, 788 tons, as compared with 777 in August, 1919; 737 in August, 1918; 684 in August, 1917, and 646 in August, 1916.

The average mileage per freight car per day in August was 27.4, the highest that has been recorded in any month since July, 1917, exceeding the average for any month during federal control. It was exceeded in May, June and July, 1917, when the average car mileage was 29, 28.4 and 28.3, respectively.

Probably the most significant statistical measure of freight car performance is the average net ton miles per car per day. For the months since the roads were returned to private control this average has been as follows: March, 487; April, 401; May, 488; June, 504; July, 523; August, 557. For the year 1917 the average was 495, for 1918 it was 491 and for 1919 it was 441. The August, 1920, figure of 557 has never been equalled. In August, 1919, the net ton miles per car day averaged 475 and in August, 1918, 534.

Through the efforts of the railroad managers, continued progress is also being made in the "unscrambling" of freight cars, which, from the standpoint of ownership, were widely distributed during the period of federal control through the system of pooling equipment. On November 1 the total of all cars on home lines was 31.3 per cent, a gain of 1.3 per cent, or 30,000 cars, as compared with the total on October 1. The principal gain for the month was in the number of box cars returned, which showed an improvement of 2.1 per cent over the previous month. When the government turned the roads back to their private owners on March 1 the number of cars on home lines was only 21.9 per cent, as compared with 44 per cent when federal control began on January 1, 1918. Under normal conditions the number should be about 50 per cent.

The relocation of cars is part of the program being carried out by the railroad executives to provide more service to the public, for by restoring the normal number of cars to home roads a better condition of repairs can be secured more rapidly.

September Earnings Do Not Show Full Effect of Rate Increase

The net operating income for September of the Class 1 railroads of the country fell approximately $29,343,000, or 26.9 per cent, short of the amount expected to be earned under the increased rates fixed by the Interstate Commerce Commission in accordance with the Transportation Act. The figure is based on reports from 207 railroads having a total mileage of 237,899 miles. The net railway operating income for September was $79,876,655, a gain of only 2.8 per cent over that for the same month in 1919, despite the increased rates. It was also only approximately $4,800,000 above the standard return which the railroads would have received had they still

been operating under the guaranty provided for them in the Transportation Act, but which ended on September 1. On the basis of a return of 6 per cent to be earned on the tentative valuation made by the Interstate Commerce Commission for rate-making purposes, the net operating income for September should have been $109,220,000.

Total operating revenues for the 207 roads amounted to $617,162,978, or an increase of 23.7 per cent, over September last year, while operating expenses were $509,013,974, or an increase of 27.2 per cent, compared with the same month in 1919.

In accounting for the situation it should be pointed out that part of the freight movement in September started prior to the effective date of the increased freight rates, and also that some states have so far failed to authorize, for traffic within state lines, the increase in rates allowed by the Interstate Commerce Commission. A better test for results of the new rates will be shown by the reports for October and November. The fact that many of the roads were spending more than usual on deferred maintenance is also a factor the full effect of which cannot yet be measured.

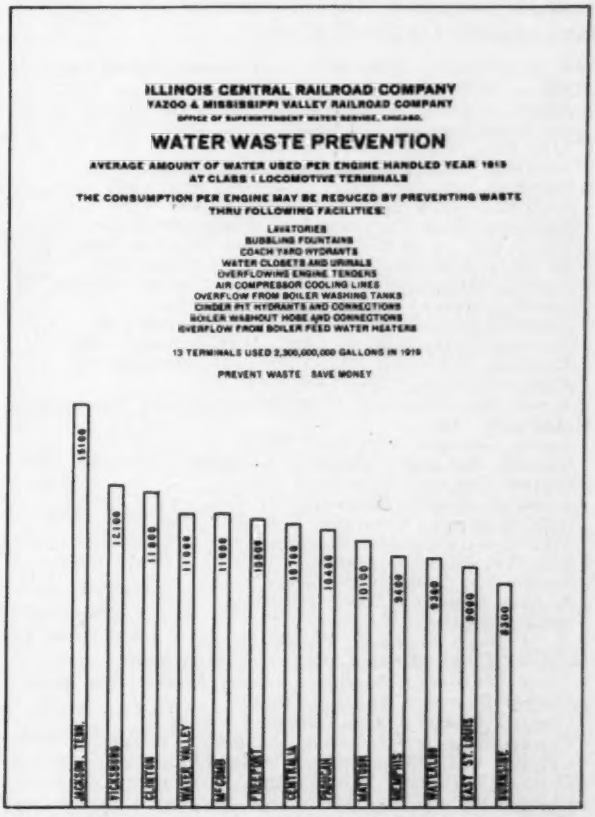
C. & E. I. Goes to Court of Claims

The Chicago & Eastern Illinois has filed in the United States Court of Claims a petition asking the court to determine the amount of its just compensation for the use of its property by the government during the 26 months' period of federal control guaranteed by the government under the federal control act, as to which it has failed to reach an agreement with the director general of railroads. The company claims that its just compensation should be $18,801,397 or at the rate of $8,677,560 a year, and that it has collected $4,194,000 from the director general at different times on account, leaving a balance of $14,607,397. This is the first road to resort to the Court of Claims for an adjustment of the amount of the so-called guaranty for the federal control period. The director general offered the railroad as compensation $3,280,000 a year. A board of referees appointed by the Interstate Commerce Commission rendered a report finding that $4,450,000 a year would be just compensation. The petition states, however, that counsel for the director general have notified the receiver of the road that the director general would not pay the amount awarded by the referees and is unwilling to offer a greater amount than his original offer of $3,280,000.

A board of referees appointed by the Interstate Commerce Commission has submitted a report to the President, finding that the just compensation of the Chicago & Alton for the use of its property by the government during the period of federal control is $3,178,314.92 for each year, conditioned upon the observance by the government and plaintiff of the provisions of the standard contract as to upkeep. This amount is the standard return for this company based on its net operating income for the three years ending June 30, 1917. The company, which failed to reach an agreement with the Railroad Administration, claimed that its compensation should be not less than $4,592,500, or 5½ per cent on a valuation of $83,500,000. The company also claimed that if its just compensation be based upon its earning capacity, the condition, value and transportation capacity may be best judged by its railway operating income for the year ended June 30, 1917, which amounted to $4,105,000, but which the company asserted should be increased by amounts of $111,720 and $375,780, respectively, because of excessive and abnormal charges during that year for depreciation and equipment and for deferred maintenance. By so readjusting its income, the company had reached the conclusion that its just compensation, when measured by its earnings, would also be $4,592,500.

A GRAPHICAL DEMONSTRATION OF WATER WASTE

VARIOUS methods have been devised by water service officers of railroads to impress upon the minds of the employees the necessity for being careful in the use of water. In general these have demonstrated the large quantities of water being wasted or the amount to be lost through orifices of various sizes, as well as to call attention to the large amount of money that is being expended by the railroads for water. It has remained for the Illinois Central to issue a graphical chart placing the consumption of water at various terminals on a comparative basis. This chart makes a comparison between the average amount of water used at the various engine terminals per engine handled in the year 1919. It shows that there is a wide variation in the relative consumption, the greatest proportional consumption being nearly twice the lowest. The notice also indicates the principal items



The Poster Shows Comparative Water Consumption

of water consumption that afford opportunities for reducing waste.

The greater variation in the relative consumption of water per engine handled is due no doubt in part to the difference in sizes of various engines as well as to the extent to which water is used for other purposes than in handling locomotives, although this will not by any means explain the great difference in the use of water per engine handled at various terminals throughout the United States.

It should be understood that the graphical chart presented herewith represents conditions on a railroad which has given the study of water waste prevention particular attention, and when this fact is considered it is obvious that a comparison of the consumption on railroads where the prevention of water waste has not been considered

would present some startling figures. These charts form only a part of the material used by the Illinois Central in their intensive campaign against water waste and that the use of such matter is productive of results is evidenced by the fact that in the five years ending December 31, 1919, this road effected a saving in cost of water through prevention of waste of $326,894, an average saving per year of over $65,000.

RAILWAY APPLIANCES ASSOCIATION ANNOUNCES LIST OF EXHIBITORS

THE directors of the National Railway Appliances Association held a meeting on November 8 in the office of the secretary-treasurer at Chicago. At this meeting space for the exhibit to be held in the Coliseum at Chicago on March 14-17, inclusive, 1921, was awarded to all firms having made application up to this time, leaving only eight per cent of the total space available unassigned. The list of firms to whom space has been assigned to date is as follows:

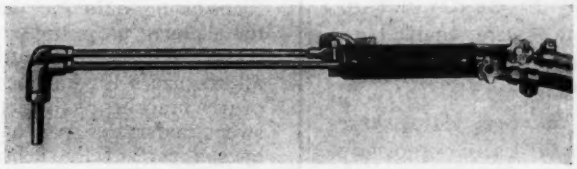
A. G. A. Railway Light & Signal Company, Elizabeth, N. J.
Adams & Westlake Company, Chicago.
Adams Motor & Manufacturing Company, Chicago.
Air Reduction Sales Company, New York City.
Ajax Forge Company, Chicago.
American Association of Engineers, Chicago.
American Abrasive Metals Company, New York City.
American Car & Foundry Company, New York City.
American Chain Company, Inc., Bridgeport, Conn.
American Hoist & Derrick Company, St. Paul, Minn.
American Kron Scale Company, New York City.
American Manganese Steel Company, Chicago Heights, Ill.
American Spike Company, New York City.
American Steel & Wire Company, New York City.
American Valve & Meter Company, Cincinnati, Ohio.
American Vulcanized Fibre Company Pittsburgh, Pa.
Anchor Company, New York City.
Armco Iron Culvert & Flume Manufacturers' Association, Middletown, Ohio.
Austin Company, Cleveland, Ohio.
Balkwill Manganese Crossing Company, Cleveland, Ohio.
Barrett Company, New York City.
Benjamin Electric Manufacturing Company, Chicago.
Bethlehem Steel Company, Bethlehem, Pa.
Blaw-Knox Company, Pittsburgh, Pa.
Boss Nut Company, Chicago.
Bryant Zinc Company, Chicago.
Bucyrus Company, South Milwaukee, Wis.
Buda Company, Chicago.
H. M. Byers Company, Pittsburgh, Pa.
Carbic Manufacturing Company, Duluth, Minn.
Carter Bloxonend Flooring Company, Kansas City, Mo.
Central Electric Company, Chicago.
Chicago Bridge & Iron Works, Chicago.
Chicago Flag & Decorating Company, Chicago.
Chicago Malleable Castings Company, Chicago.
Chicago Pneumatic Tool Company, Chicago.
Chicago Railway Signal & Supply Company, Chicago.
Chipman Chemical Engineering Company, Inc., New York City.
Clark Car Company, Pittsburgh, Pa.
Cleveland Railway Supply Company, Cleveland, Ohio.
Copper Clad Steel Company, Rankin, Pa.
Crerar Adams & Company, Chicago.
Detroit Graphite Company, Detroit, Mich.
Diamond State Fibre Company, Bridgeport, Pa.
Paul Dickinson, Inc., Chicago.
Dillworth Porter & Company, Inc., Pittsburgh, Pa.
Joseph Dixon Crucible Company, Jersey City, N. J.
Duff Manufacturing Company, Pittsburgh, Pa.
Thomas A. Edison, Inc., Bloomfield, N. J.
Edison Storage Battery Company, Orange, N. J.
Electric Auto-Lite Company, Toledo, Ohio.
Electric Storage Battery Company, Philadelphia, Pa.
Elliott Frog & Switch Company, East St. Louis, Ill.
Eymon Crossing Company, Marion, Ohio.
Fairbanks Morse & Co., Chicago.
Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn.
Federal Signal Company, Albany, N. Y.
H. K. Ferguson Company, Cleveland, Ohio.
Friction Car Stop Company, Cleveland, Ohio.
Frog, Switch & Manufacturing Company, Carlisle, Pa.
General Automatic Scale Company, St. Louis, Mo.
General Electric Company, Schenectady, N. Y.
General Railway Signal Company, Rochester, N. Y.
Gilbert & Barker Manufacturing Company, Springfield, Mass.
Gould Storage Battery Company, Chicago.
Graver Corporation, East Chicago, Ind.
W. & L. E. Gurley, Troy, N. Y.
Hall Switch & Signal Company Garwood, N. J.
Hatfield Rail Joint Manufacturing Company, Macon, Ga.
Hayes Track Appliance Company, Richmond, Ind.
Hazard Manufacturing Company, Wilkes-Barre, Pa.
W. F. Hebard & Co., Chicago.
Hubbard & Co., Pittsburgh, Pa.
Imperial Belting Company, Chicago.
Ingersoll-Rand Company, New York City.
H. W. Johns-Manville Company, New York City.
O. F. Jordan Company, East Chicago, Ind.
Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Paul J. Kalman Company, Chicago.
Kaustine Company, Inc., Buffalo, N. Y.
Kelly-Derby Company, Inc., Chicago.
Kerite Insulated Wire & Cable Company, Inc., New York City.
Keuffel & Esser Company, Hoboken, N. J.
Keystone Grinder & Manufacturing Company, Pittsburgh, Pa.
Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.
Lackawanna Steel Company, Lackawanna, N. Y.
Layne & Bowler Company, Memphis, Tenn.
Lehon Company, Chicago.
Lufkin Rule Company, New York City.
Lundie Engineering Corp., New York City.
M. W. Supply Company, Philadelphia, Pa.
MacLeod Company, Cincinnati, Ohio.
MacRae's Blue Book, Chicago.
Maintenance Equipment Company, Chicago.
Massey Concrete Products Corporation, Chicago.
Mercury Manufacturing Company, Chicago.
Metal & Thermit Corporation, New York City.
Midvale Steel & Ordnance Company—Cambria Steel Company—Philadelphia, Pa.
Miller Train Control Corporation, Danville, Ill.
Monroe Calculating Machine Company, New York City.
Morden Frog & Crossing Works, Chicago.
Mudge & Co., Chicago.
National Boiler Washing Company, Chicago.
National Carbon Company, Inc., Cleveland, Ohio.
National Indicator Company, Inc., Long Island City, N. Y.
National Lead Company, New York City.
National Lock Washer Company, Newark, N. J.
National Malleable Casting Company, Cleveland, Ohio.
National Water Main Cleaning Company, New York City.
George P. Nichols & Brother, Chicago.
North American Engine Company, Algona, Iowa.
Northwestern Motor Company, Eau Claire, Wis.
Ogle Construction Company, Chicago.
Ohio Brass Company, Mansfield, Ohio.
Okonite Company, Passaic, N. J.
O'Malley-Beare Valve Company, Chicago.
Oxweld Railroad Service Company, Chicago.
P. & M. Company, Chicago.
Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.
Pocket List of Railroad Officials, New York City.
Positive Rail Anchor Company, Marion, Ind.
Protective Signal Manufacturing Company, Denver, Colo.
Pyrene Manufacturing Company, Chicago.
Q. & C. Company, New York City.
Rail Joint Company, New York City.
Railroad Herald, Atlanta, Ga.
Railroad Supply Company, Chicago.
Railway Review, Chicago.
Ramapo Iron Works, Hillburn, N. Y.
Rawls Machine & Manufacturing Company, Chicago.
Reade Manufacturing Company, Hoboken, N. J.
Refinite Company, Omaha, Neb.
Rensselaer Valve Company, Troy, N. Y.
Richards-Wilcox Manufacturing Company, Aurora, Ill.
Roberts & Schaefer Company, Chicago.
St. Louis Frog & Switch Company, St. Louis, Mo.
Selleys Manufacturing Company, Chicago.
Sherwin-Williams Company, Cleveland, Ohio.
Signal Accessories Corporation, New York City.
Simmons-Boardman Publishing Company, New York City.

Simonds Manufacturing Company, Fitchburg, Mass.
T. W. Snow Construction Company, Chicago.
Southern Hardware & Supply Company, St. Louis, Mo.
Steel Sales Corporation, Chicago.
Templeton-Kenly Company, Inc., Chicago.
Toledo Scale Company, Toledo, Ohio.
Torchweld Equipment Company, Chicago.
Track Specialties Company, New York City.
Union Switch & Signal Company, Swissvale, Pa.
U. S. Wind Engine & Pump Company, Batavia, Ill.
Verona Tool Works, Chicago.
Volkhardt Company, Inc., Stapleton, N. Y.
Walls Frogless Switch & Manufacturing Company, Kansas City, Mo.
Waterbury Battery Company, Waterbury, Conn.
Wayne Oil Tank & Pump Company, Fort Wayne, Ind.
Western Electric Company, Inc., New York City.
Woolery Machine Company, Minneapolis, Minn.
Wyoming Shovel Works, Wyoming, Pa.
Yale & Towne Manufacturing Company, Stamford, Conn.

NEW CUTTING AND WELDING TORCHES

A NEW LINE of cutting and welding torches has been introduced recently by the A. G. A. Railway Light & Signal Co., Elizabeth, N. J., which is of interest because of their simplicity, ruggedness, low cost of maintenance and safety of operation.

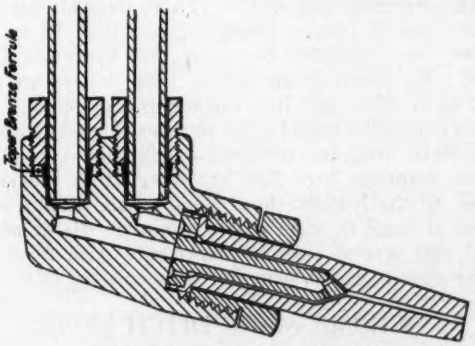
The standard torch of this make weighs about 28 oz. and with hose attached balances at a point in the center of the grip. The grips are made of a ventilated, non-conducting material, oval in cross-section and corrugated.



A. G. A. Cutting and Welding Torch

The gas connections are indicated by distinctive colors, the center of the valve handles being painted red for the acetylene and black for the oxygen. This color scheme is carried out in the hose and as the valves are also plainly indicated with the words "oxygen" and "acetylene" there is little danger of wrong connections.

The heads and valve bodies of the torch are made of drop-forged bronze, while the gas tubes are of seamless



Cross Section of Torch Head

drawn brass. All nuts having considerable wear are made of phosphorous brass. The gas tubes are threaded into the valve body, while at the head they are tightened into the forging by taper bronze ferrules forced tightly about the tubes by hexagonal nuts.

The mixture of the gases is accomplished at the tips, which are of the one-piece type. The high pressure valve of the cutting torch is operated by the thumb in such a way that a single motion will open or close it. A welding table is furnished with the torches and the tips are so made that reference to the line in the table showing the thickness of metal in sixteenths of an inch will give the number of the tip to be used, beside the proper gas pressure. Complete mixing is accomplished by forcing the oxygen and acetylene together at equal pressures, passing the mixture through a restricted conical orifice which sets up a turbulent effect in the stream of the gas and at the same time creating a velocity which prevents back-flash.

RAIL STATISTICS SHOW FURTHER REDUCTIONS IN FAILURES

FURTHER progress in the reduction of rail failures is evidenced in the latest report on this subject issued by the American Railway Engineering Association. The annual statement prepared by M. H. Wickhorst, engineer of tests for the Rail committee, which appears in Bulletin No. 229, published by the association, shows that failures in five years of rails rolled in 1914 averaged 74 per 100 miles of track as compared with 91.9 failures for 1913 rails and 398.1 failures for rails rolled in 1908, the first year for which complete statistics are available. On the other hand, the partially complete data now avail-

TABLE 1—AVERAGE FAILURES PER 100 TRACK MILES.

Year Rolled	Year Service 0	1	2	3	4	5
1908	...	....	....	.....	.....	398.1
1909	...	....	....	.....	224.1	277.8
1910	...	....	....	124.0	152.7	198.5
1911	...	....	77.0	104.4	133.3	176.3
1912	...	28.9	32.1	49.3	78.9	107.1
1913	2.0	12.5	25.8	44.8	69.5	91.9
1914	1.2	8.2	19.8	32.9	50.9	74.0
1915	0.7	8.9	19.0	34.2	53.0	.....
1916	1.6	11.8	29.2	47.7	.....	.....
1917	5.3	21.6	38.9	.....	.....	.....
1918	1.6	8.9	....	.....	.....	.....
1919	2.0	....	....	.....	.....	.....

able for rails rolled since 1914 indicates less favorable results. This is clearly evident in Table I, showing complete summarized statistics to date. Mr. Wickhorst's comment on this is that, "During the war and for a while thereafter, there were difficulties in the way of maintaining a high standard of quality in the manufacture of rails, but a study of the detail results suggests that in some cases there may have been a loss of control of the mill situation."

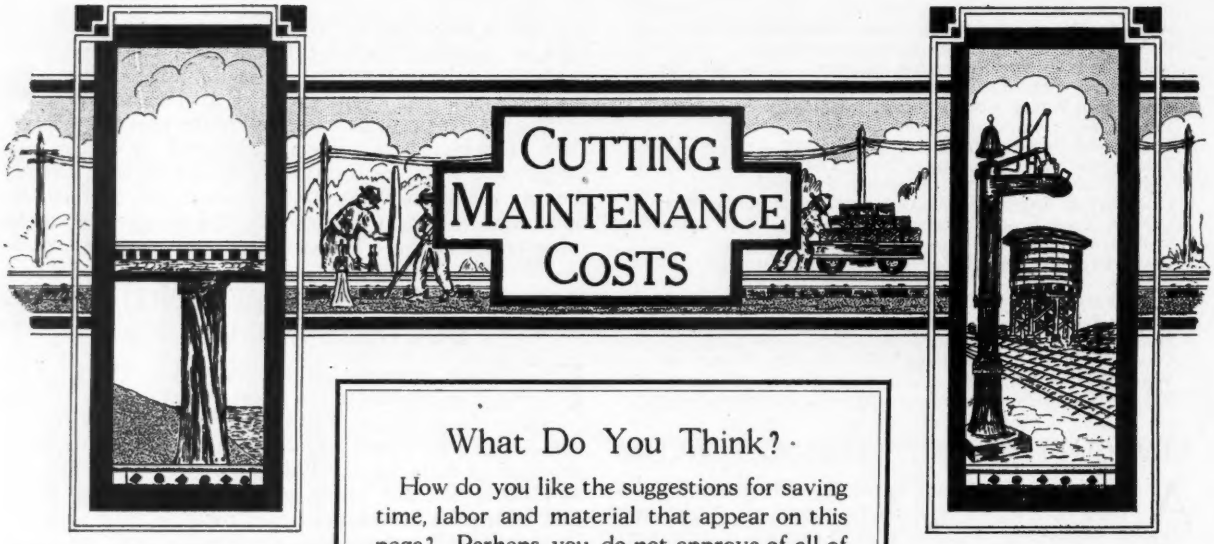
As to future performance the feeling is more favorable since the reports states that "A drop in the failures from almost 400 per 100 track miles for five years' service in the 1908 rails to 74 in the 1914 rails, is a decrease of over 80 per cent. A close study of the detail reports indicates that a further decrease of over 80 per cent of the failures of the 1914 rails is possible. We should now set up as a new objective the reduction of the failures to below 10 per 100 track miles for five years' service, or below two failures per 100 track miles per year."

The tonnages and track miles of rail represented by the statistics in this report are given below:

TABLE II.

Year Rolled	Tons	Track Miles
1914	1,149,410	7,917.26
1915	1,077,558	7,280.51
1916	1,245,185	8,407.55
1917	1,136,944	7,615.46
1918	947,073	6,354.44
1919	620,250	4,272.95
Totals	6,176,420	41,848.17

As there have been comparatively few Bessemer rails listed in recent years, they are no longer listed separately.



What Do You Think?

How do you like the suggestions for saving time, labor and material that appear on this page? Perhaps you do not approve of all of them and have better methods to propose for doing the same work. More likely a reading of these short articles suggests methods you have employed in solving other problems. Even if some of your methods seem commonplace to you they may be entirely new to others. Therefore, if we were enabled to publish an account of your methods they would no doubt help someone else to carry out his work. The *Railway Maintenance Engineer* will pay $5 for a description of any money saving device or method that is not generally known or used or which has not been previously described in these columns or elsewhere. Send such contributions to the editor, 608 South Dearborn Street, Chicago.

PROTECTING ADZES FROM DAMAGE

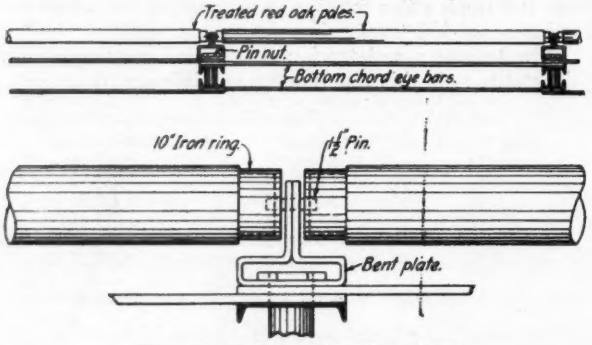
A. M. Clough
Supervisor, New York Central, Batavia, N. Y.

ONE OF THE tools most difficult to maintain in proper condition is the adze as used by the track forces. Owing to the fact that adzing is always done close up to the rail, there is always danger that the edge of the adze will come in contact with the base of the rail or with the tie plate. In case of rail renewals where new tie plates are to be used, it has been customary to use the adze to hit the corner of the old tie plate to lift it out of its seat in the tie. This, of course, is very hard on the adze, and I have found it of advantage to provide a small steel point to be placed on the head of the adze so as to lift up the tie plate.

A NOVEL BRUSH GUARD

By an Engineer

IN LOCATIONS where the clearance between the underside of the bridge span and the high water level is small, trouble is frequently experienced with accumulations of brush against the upstream side of the bridge during flood periods. The difficulty is increased in the ordinary design of plate girders and truss spans owing to the fact that the shelving projections of bottom flanges or chords afford places for lodgment of tree branches as they are swept under the span and once a part of the debris becomes caught in this way, a large accumulation is quickly formed. The bridge department of the Chicago, Burlington & Quincy devised a rather unusual plan for lessening the work of clearing away debris on a short span in northern Illinois by providing a guard on the upstream side of the bridge which serves to deflect the debris underneath the bridge. To accomplish this a continuous line of rollers, something less than 12 in. in diameter, was installed alongside the upstream bottom chord. As shown in the sketch, these rollers are placed on a level with and just outside the eye-bars. These rollers consist of round poles or piles capped at each end by a 10-in. ring and mounted on spindles consisting of 1½-in. diameter bars that are hung from brackets attached to the bottom chord pins. This device was installed at small expense with a minimum use of new material and several seasons' experience with flood water in the stream has shown that it is entirely effective.



How the Rollers Were Attached

A HOME MADE DITCH LEVEL

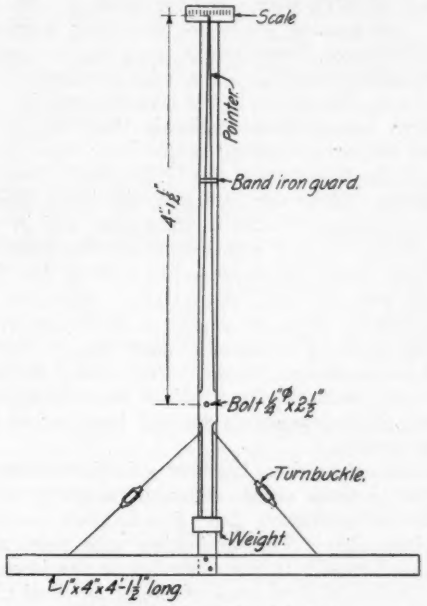
By C. S. Lusk

Section Foreman, Erie railroad, Alfred Station, N. Y.

SEVERAL years ago I had charge of a gang laying drain tile in side ditches and as a result of this experience I developed a hand level for use in such work. When the grade of the track is sufficient to provide for the flow of water, it is an easy matter to cut the ditch grade by using a straight edge and a level from the rail, but when the grade of the track is not enough to produce

a flow of water it is necessary to get the grade some other way, and when grade stakes are not set by engineers with a level some other method must be used.

The hand level developed consists of a large T-square mare of 1-in. by 4-in. boards braced by turnbuckles taken from an old buck saw. To the stem of this T-square I attached a pointer, pivoted near its lower end and weighted at the bottom so that it will always stand exactly vertical. A scale placed at the upper end of the stem of this T-square shows the amount that the pointer



A Pendulum Hand Level

deviates from the axis of the square. For my own purpose, I made this read in inches and fractions of an inch for each quarter rod. Accordingly, I made the distance from the pivot of the pointer to the scale exactly 4 ft. 1½ in. and I also made the cross of the square this same length, which is exactly one-quarter of a rod.

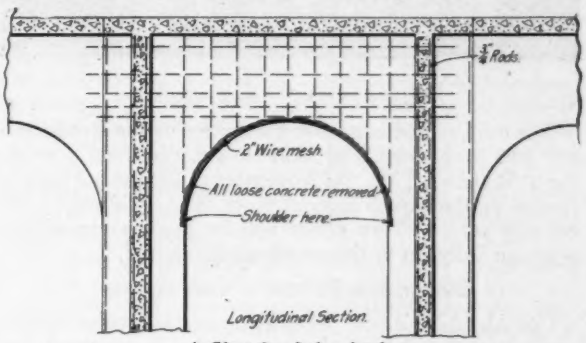
THE REPAIR OF A CONCRETE SURFACE

By J. R. GEORGE

THE REPAIRING or patching of a defective concrete surface or the placing of a relatively thin coating of concrete is a troublesome piece of work, especially so if it must be placed on a bottom surface such as the soffit of a concrete arch. The writer was confronted with a problem of this kind and solved it by the use of a thin cement mortar or grout that could be flowed into place over the form surface.

The illustration shows the detail of one span of a bridge consisting of a series of false arches, namely, two continuous concrete walls 3 ft. thick, pierced by openings of 22-ft. span in the shape of semi-circular arches, these two walls being spanned transversely by 15-in. I-beams incased in concrete to form the bridge floor. A laborers' commissary building which was located directly under one of these arches caught on fire from some unknown cause and burned down, damaging the concrete of the arch so that the concrete spalled out for a depth of from two to four inches and exposed some of the reinforcing.

To replace the damaged concrete, the arch surface was gone over carefully to remove all loose concrete with a hammer and stonemason's point, after which the surface was washed with clean water. Two-inch wire mesh was then spread over the surface of the arch and attached to the concrete and reinforcing steel to hold it in place. When this had been completed, forms were erected which conformed to the original outline of the arch with side forms on each side that made a close fit with the concrete walls. An opening was left in the forms at the crown which was attached to a spout through which a grout mixed of one part of cement and two parts of sand was poured. This was made sufficiently liquid so



A Sketch of the Arch

that it would run down the forms from the crown to the springing line with no mechanical assistance other than to tap the forms lightly with a hammer. To insure proper hydration of the fresh mortar, the forms and surface of the old concrete were thoroughly wetted before starting the work.

This concrete has been in place for the past three years and close inspection shows no indication of any separation of the patch from the original masonry.

LAYING THE DUST FROM BALLAST

A. M. CLOUGH
Supervisor, New York Central, Batavia, N. Y.

ANYONE who has ridden on the observation platform knows how quickly the passengers are forced to retreat to the inside of the car by the cloud of dust which arises as soon as the train enters a section of track on which new ballast has been dumped in dry weather. Nearly as much discomfort is caused passengers in dining

A Roadbed Sprinkling Car

cars under the same circumstances. To overcome this nuisance on a highly developed passenger line, it has been found of considerable advantage to sprinkle the ballast whenever favorable rains do not serve this end. The photograph shows a flat car equipped with two square water tanks connected with perforated pipes underneath the car for this purpose.

ROADMASTERS' ASSOCIATION

The officers and executive committee of the Roadmasters' and Maintenance of Way Association held a meeting at Richmond, Va., on November 6, for the purpose of discussing the assignments of work to committees for the ensuing year. Every effort will be made to provide a program fully up to the established standard.

BRIDGE AND BUILDING ASSOCIATION

Consideration is now being given to the appointment of committees for the ensuing year and it is expected that the selection will have progressed sufficiently far for announcement of the personnel of committees to be made in the next issue.

AMERICAN RAILWAY ENGINEERING ASSOCIATION

The committees are now actively engaged in the completion of their reports and several are expected to be placed in the hands of the secretary within a few days. Bulletin No. 229 containing the annual report on failed rail statistics and a monograph entitled a "Manual of Instructions for the Guidance of Engineering Field Parties" by H. H. Edgerton, assistant engineer, Chicago Great Western, has just been mailed to the members, while Bulletin No. 230 containing a report of the committee on Signals and Interlocking will go into the mail within a few days.

WOOD PRESERVERS' ASSOCIATION

Plans are rapidly approaching completion for the annual convention which will be held in San Francisco, Cal., on January 25-27, 1921. Those members from the east will leave Chicago in special cars over the Chicago, Burlington & Quincy on Saturday morning, January 15, for Seattle, Wash., via Billings, Mont., with connecting cars from St. Louis and Kansas City, Mo., which will join the main party at Lincoln, Neb. The party will arrive at Seattle on Tuesday evening, January 18, and will spend the following day visiting the plants of the Pacific Creosoting Company and the Coleman Creosoting Company. On the following day opportunity will be afforded the members to visit the docks, saw mills or other features of interest in the vicinity of Seattle.

The party will leave for Portland, Ore., on Thursday evening and will spend Friday observing logging operations in the timber northwest of Portland. On Friday evening they will be the guests of the West Coast Lumbermen's Association at its annual dinner at the Multnomah hotel, Portland. On Saturday a visit will be made to the St. Helens Creosoting Company, St. Helens, Ore., where the recently developed perforating machine for perforating Douglas fir ties preliminary to treatment will be in operation.

The convention party will leave Portland on Sunday evening for San Francisco, arriving there Tuesday morning, January 25. Following the close of the convention on Thursday afternoon opportunity will be afforded for the inspection of the redwood forests and of the piling in the vicinity of San Francisco Bay, which has recently been subjected to severe attacks of marine borers.

THE MATERIAL MARKET

MUCH OF THE uncertainty in the iron and steel market has been removed by a statement issued by E. H. Gary, chairman of the board of directors of the United States Steel Corporation, on November 19, in which he announced that base prices for iron and steel products observed by all subsidiaries of the corporation during the past year will "continue in force for the time being." Owing to the enormous impetus given to the iron and steel market after these prices were established in the spring of 1919, they were for many months merely nominal, representing prices for decidedly indefinite delivery. Moreover, these figures were not recognized by the independent manufacturers, who consistently quoted higher prices. However, in the last two months or more it has been impossible to maintain these higher quotations and the actual selling prices have been gradually slipping in the direction of the U. S. Steel Corporation's basic figures. However, owing to the large differential that has continued to exist in some lines and in view of rumors of an upward adjustment of the corporation's basic prices, much uncertainty has existed, but this has now been removed by Judge Gary's statement, which should serve to bring actual prices much nearer to the established level. The announcement also gives renewed life to the corporation's price for steel rails of $45 and $47 for Bessemer and open-hearth steel, respectively. In the meantime, the independents are still insisting on at least $10 more per ton.

In the meantime, there has been a further weakening of the prices of some commodities, particularly structural steel with an indication also of reductions in the price of cast iron pipe. Nails and other wire products seem to be more stable. In the table below the lower figure given is the established price of the U. S. Steel Corporation, while the higher quotation is the average price being asked by the independents.

	Prices in Cents Per Pound			
	October 21		November 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	3.35 to 4.25	3.73 to 4.38	3.35 to	3.73 to 4.38
Track bolts	4.35 to	4.73 to 5.38	4.35 to	4.73 to 5.38
Angle bars	2.75 to	2.75 to	2.75 to	2.75 to ....
Tie plates, steel	2.75 to	2.75 to 4.00	2.75 to	2.75 to 3.50
Tie plates, iron	2.75 to	2.75 to 4.00	2.75 to	2.75 to 4.00
Plain wire	3.25 to 4.00	3.63 to 4.38	3.25 to 4.00	3.63 to 4.38
Wire nails	3.25 to 4.50	3.63 to 4.88	3.25 to 4.50	3.63 to 4.88
Barbed wire, galv.	4.10 to 5.10	4.48 to 5.48	4.10 to 5.10	4.48 to 5.48
C. I. pipe, 6 in. or larger (per ton)		$83.10		$83.10
Plates	2.62 to 3.25	3.03 to 3.63	2.65 to 3.00	3.03 to 3.38
Shapes	2.45 to 3.10	2.83 to 3.48	2.45 to 3.00	2.83 to 3.48
Bars (steel)	2.35 to 3.25	2.73 to 3.63	2.35 to 3.00	2.73 to 3.38

The scrap market offers an interesting index of present conditions in the iron and steel market. During the last month the bids on scrap have fallen from $4 to $8 per ton, which brings the prices lower than they have been at any time since March, 1919.

	Per Gross Ton	
	Chicago	St. Louis
Relaying rails	$50.00 to $55.00	$40.00 to $45.00
Rerolling rails	24.00 to 24.50	27.00 to 27.50
Rails less than 3 ft. long	21.00 to 21.50	18.50 to 19.00
Frogs and switches, cut apart	18.50 to 19.00	17.50 to 18.00
	Per Net Ton	
No. 1 railroad wrought	16.50 to 17.00	18.50 to 19.00
Steel angle bars	18.00 to 18.50	17.00 to 17.50

One commodity in the building material line seems to withstand the pressure toward reductions better than any other. This is Portland cement. No weakening of prices of this commodity has been noted thus far. Lumber is taking further tumbles. Mill prices on actual sales have fallen from $2 to $15 for both southern pine and Douglas fir during the last 30 days.

GENERAL NEWS DEPARTMENT

The annual session of the American Railroad Association was held at the Blackstone hotel, Chicago, on November 17, this being the first one to be held in three years. R. H. Aishton, president of the association, presided. Among other matters brought before this meeting were the adoption as standard of a considerable number of specifications and rules of practice recently adopted by the American Railway Engineering Association.

Automatic train control received a marked impetus recently in England by the decision of the British Ministry of Transport to appoint a committee on automatic train control which, it is unofficially reported, will be composed of Colonel J. W. Pringle (government inspector), chairman; Major G. L. Hall (government inspector), secretary; E. C. Cox, South Eastern & Charham; George Hughes, Lancashire & Yorkshire, and W. C. Acfield, Midland.

The Lehigh Valley has inaugurated a plan to assist employees in the purchase of the common stock of that road on the installment plan. The railroad buys the stock on the open market and makes monthly deductions from the wages of any employee, who desires to purchase the stock, at the rate of $5 for each share subscribed. The total number of subscriptions up to the middle of November was 1,116, or approximately 4½ per cent of the total number of employees.

A General Freight Claim prevention movement was inaugurated in a freight claim prevention congress held at the Hotel La Salle, Chicago, on November 15 and 16, under the direction of the American Railroad Association. In his opening address at this meeting Mr. Aishton, president of the A. R. A., called attention to the fact that there has been an enormous increase in loss and damage and that in 1919 3.67 cents out of every dollar taken in by the railroads in freight revenue was paid back to the shippers for damage done. This loss is nearly three times as large proportionately as in 1914.

Several tracks of the Pennsylvania were buried at Twenty-sixth street, Pittsburgh, Pa., by a recent landslide which also endangered main-track train movements. The trouble started in a street on the top of the high bluff which borders the railroad on the south side at that point, necessitating the construction of a bridge 100 ft. long to keep street traffic moving. A considerable section of the railroad's roadbed kept moving northward at the rate of 10 feet a day. Twenty-sixth street is about a mile east of the Union station. Preparations were made for detouring all main line trains by way of the Brilliant cut-off and the line on the north side of the Allegheny river.

An exposition of an unusual character was held in St. Louis, Mo., on October 25 to 30, inclusive, for the display of railway appliances under the auspices of the St. Louis Railway Club and the Railroad Y. M. C. A. The object of this exposition was to promote educational work along technical lines among railway employees, and the various railroads centering at St. Louis co-operated generously with those arranging for the exposition so that the employees were afforded ample opportunity to attend. In addition to the exhibit of appliances, programs were arranged for the various days, making it a special point to interest some particular railway on each day.

A proper method for determining a just allowance for maintenance of way and structures and maintenance of equipment during the first six months' guarantee period has been a matter of vital interest to the railroads for some time owing to the important part it plays in determining the amount which the government must pay to the railroads under the guarantee clause of the Transportation act. A subcommittee of the Adjustment committee, representing the carriers in this matter, has been at work on the study of this matter for some time and recently submitted the results of its study in the form of formulas for determining these allowances. These are expressed in tabular form, indicating the quantities it is necessary to compile and showing how these must be combined mathematically to obtain the calculated allowance.

The American Society of Civil Engineers decided against becoming a charter member of the Federated American Engineering Societies through a popular vote of its members, in which 3,278 voted against and 2,330 for the proposition. Pursuant of this result of the election, the Board of Direction of the association passed a resolution on November 9 definitely expressing the unwillingness of the society to participate in any movement to transfer the activities of Engineering Council to the newly organized Federated Engineering Societies.

The first regular meeting of the American Engineering Societies was held in Washington on November 18, 19 and 20, at which time a permanent organization was put into effect and Herbert Hoover, former food administrator and president of the American Society of Mechanical Engineers, was elected president of the American Engineering Council, the new representative body associated with the American Engineering societies. A total of 21 member societies and 9 societies that have not yet taken final action participated in the meeting. The proceedings of this convention included the election of officers, the subdivision of the country into districts for the representation of local affiliated societies and the apportionment of representation. It was also decided to extend the time during which societies can enter as charter members to July 1, 1921. Washington, D. C., was made the permanent headquarters. The activities of the new council during the coming year will be governed by the available revenue, which is estimated between $59,000 and $80,000. Attention will be directed primarily to the reduction of economic wastes and the advocacy of a National Department of Public Works.

SUBORDINATE OFFICIALS DEFINED

The scope of the term subordinate officials has been defined more specifically as regards the personnel of the maintenance of way department in a new order by the Interstate Commerce Commission. This order supersedes the one issued by the commission on March 23, 1920, and contains revised regulations designating the classes of employees that are to be included within the term subordinate official under Title III of the Transportation Act of 1920. In other words, it defines those who are to participate with the general rank and file of railway employees in the nomination of members of the Railway Labor Board. The complete statements of the order as applied to maintenance of way "subordinate officials" are contained in the two paragraphs given in full below:

Foremen, Supervisors and Roadmasters. This class shall include roadmasters with rank and title not higher than division roadmaster, track supervisors, maintenance inspectors, supervisors of bridges and buildings, with rank and title below that of superintendent of bridges and buildings, supervising carpenters with rank below that of superintendent, supervisors of water supply, supervisors and inspectors of signals with rank and title below that of assistant signal engineer, and foremen or supervisors of machinists, boiler makers, blacksmiths, sheet metal workers, electricians, car men, and their helpers and apprentices, with rank and title beneath that of general foreman.

Technical Engineers. This class shall include civil, mechanical, electrical and other technical engineers inferior in rank to engineers of maintenance of way, chief engineers and division engineers; engineers of maintenance of way and other technical engineers. We are of opinion that instrumentmen, rodmen, chainmen, designers, draftsmen, computors, tracers, chemists and others engaged in similar engineering or technical work are not "officials of carriers."

PERSONAL MENTION

GENERAL

C. O. Congdon, division engineer of the Central Kansas Colorado division of the Missouri Pacific, with headquarters at Osawatomie, Kan., has been appointed trainmaster of the same division, with headquarters at Hoisington, Kan., succeeding **J. C. Gerety.**

Hugh Wilson, formerly engineer maintenance of way of the Eastern division of the Chicago Great Western and recently appointed trainmaster on the Denver & Rio Grande, with headquarters at Gunnison, Colo., as noted in last month's issue, was born at Lincoln, Neb., on September 21, 1876. Mr. Wilson graduated from the University of Nebraska in 1897, having served at various times as track laborer and section foreman for the Chicago, Burlington & Quincy prior to his graduation. From 1899 until 1902 he was employed as roadmaster on this road, being promoted in the latter year to trainmaster. In 1905 he became assistant engineer on the Missouri Pacific, which position he held for six months, when he was promoted to superintendent. Mr. Wilson served as assistant superintendent of the Denver & Rio Grande from 1906 until 1909, when he was appointed trainmaster on the Northwestern Pacific, which position he held until 1911, when he was promoted to assistant superintendent. He served as railroad service expert for the Railroad Commission of California for one year, returning to the Northwestern Pacific in 1914 as assistant to the president. In 1914 Mr. Wilson was appointed special engineer on the Baltimore & Ohio, subsequently serving as assistant superintendent and superintendent on that road. He was appointed special representative to the federal manager of the Chicago Great Western in 1918, which position he held until 1919, when he was promoted to engineer maintenance of way, in which capacity he served until his recent appointment.

ENGINEERING

H. L. Kile, roadmaster on the Western Pacific, with headquarters at Oakland, Cal., has been promoted to engineer of the Western division.

H. S. Jones, valuation engineer of the Gulf, Mobile & Northern, with headquarters at Mobile, Ala., has been promoted to chief engineer, with the same headquarters, succeeding **L. W. Duffee,** who has been appointed assistant chief engineer.

Colonel H. W. Hudson, formerly engineer of construction in the transportation department of the American Expeditionary Forces, has been appointed chief engineer of the Interstate Railroad, with headquarters at Norton, Va.

E. G. Lane, engineer of maintenance of way, Western Lines of the Baltimore & Ohio, with headquarters at Cincinnati, Ohio, has been transferred to Baltimore, Md., as engineer maintenance of way of the Eastern Lines, in place of **S. A. Jordan,** who has been transferred to the Western Lines, with headquarters at Cincinnati, Ohio.

H. A. Dixon, who has been chief engineer of the Western Lines of the Canadian Northern, has had his jurisdiction extended over the Grand Trunk Pacific Lines, with the title of chief engineer, Canadian National, Western Lines and Grand Trunk Pacific. **J. A. Heaman,** assistant chief engineer of the Grand Trunk Pacific, has had his authority extended over the Canadian National Lines, with the title of assistant chief engineer, Canadian National, Western Lines and Grand Trunk Pacific.

William C. Allen, whose appointment as assistant valuation engineer of the Fort Worth & Denver City, with headquarters at Fort Worth, Tex., was announced in the November issue, was born at Hennepin, Ill., on May 7, 1886. He received his education at the University of Kansas and entered railway service in November, 1907, with the Fort Worth & Denver City as a rodman. During the next 11 years Mr. Allen served successively as instrumentman, ballast engineer, assistant engineer and assistant valuation engineer. In June, 1918, he entered military service and served with the American Expeditionary Forces as a second lieutenant in the Forty-Seventh Engineers, being engaged in construction work and as a supervisor of track. In July, 1919, upon his return to civil life, Mr. Allen was appointed engineer of the Lone Star Gas Company of Dallas, Tex., the position which he held at the time of his recent appointment.

S. H. Osborne, division engineer on the Kansas division of the Union Pacific, with headquarters at Kansas City, Mo., has been transferred to the Nebraska division, with office at Omaha, Neb., in place of **A. D. Schermerhorn,** who has been appointed assistant division engineer at Omaha, Neb., succeeding **T. J. Bivens,** promoted to division engineer of the Central division, with headquarters at Marysville, Kan. Mr. Bivens succeeds **W. H. Lowther,** transferred to the Colorado division at Denver, Colo. **W. G. Tinney,** division engineer at Denver, has been transferred to Cheyenne, Wyo., to succeed **A. R. Jurden,** division engineer on the Wyoming division, who succeeds Mr. Osborne at Kansas City.

T. J. Bivens, whose promotion to division engineer on the Union Pacific, with headquarters at Marysville, Kan., is noted elsewhere in this issue, was born at Creston, Iowa, on February 26, 1875. He entered railway service with the Union Pacific as a rodman on April 10, 1899. From 1902 until 1904 he served as assistant in the maintenance of way and construction departments and from 1904 until 1907 he was office engineer at Denver and Cheyenne. In 1907 he was assistant engineer in permanent bridge work, being transferred in 1908 to Ogden, Utah, as office engineer. In 1909 he was general foreman of second track construction, while in 1910 and 1911 he served as division engineer of the Bingham & Garfield. In 1912 he returned to the Union Pacific as assistant engineer at Denver, Colo., going to the Moffat Road in 1913 as general foreman. He again returned to the Union Pacific in 1914 as office engineer at Cheyenne Wyo., being transferred to Kansas City, Mo., in 1916. In October, 1918, he became assistant engineer in the maintenance of way department, from which position he was promoted to assistant division engineer, with headquarters at Omaha, in which capacity he served until his recent promotion.

L. Winship, senior assistant engineer in the chief engineer's office of the Missouri Pacific at St. Louis, Mo., has been promoted to division engineer, with headquarters at Nevada, Mo., succeeding **J. R. Nagel,** who has been transferred to the Wichita division, with headquarters at Wichita, Kan. Mr. Nagel replaces **E. P. Hawkins,** transferred to the Central Kansas-Colorado division, with headquarters at Osawatomie, Kan., and Mr. Hawkins succeeds **C. O. Congdon,** who has been appointed trainmaster at Hoisington, Kan. **W. C. Swartout,** assistant engineer, has been promoted to senior assistant engineer, to succeed Mr. Winship, and **C. C. Hawken,** instrumentman on the Joplin division, has been promoted to assistant engineer on the same division, in place of **J. S. Bassett,** promoted and assigned to other duties. **C. P. Huffman,** instrumentman on the Eastern division, with headquarters at Sedalia, Mo., has been promoted to assistant engineer of the Omaha division, with headquarters at Falls City, Neb., succeeding **R. M. Smith,** promoted, and **G. W. Payne,** instrumentman on the Arkansas division, with headquarters at Little Rock, Ark., has been promoted to assistant engineer of the Memphis division, with headquarters at Wynne, Ark., in place of **H. H. White,** promoted.

TRACK

E. A. Howland has been appointed roadmaster on the Dakota division of the Northern Pacific, with headquarters at Carrington, N. D., succeeding **George Cottingham, Jr.,** resigned.

T. L. Williams, roadmaster on the Southern Pacific, with headquarters at Mina, Nev., has had his authority extended to include the duties of trainmaster, succeeding **B. D. Richart,** transferred.

C. C. Clark has been appointed roadmaster of the Indio district of the Los Angeles division of the Southern Pacific, Pacific System, with headquarters at Niland, Cal., succeeding **J. W. Starkey,** assigned to other duties.

N. E. Scribner, acting supervisor on the Erie, has been promoted to track supervisor on the Kent division, with headquarters at Kent, Ohio, succeeding **G. L. Benson,** who has been transferred to succeed **J. A. Connolly,** who has resigned. Mr. Benson's headquarters are at Mansfield, Ohio.

A. A. Johnson, whose appointment as supervisor of track on the New York Central, with headquarters at Kingston, N. Y., was announced in the October issue of the *Railway Maintenance Engineer,* entered railway service in the engineering corps of the Eastern division of the New York Central upon graduating from Lafayette College with the degree of civil engineer in 1907. In 1910 he was promoted to assistant supervisor of track of the same division and six years later was appointed assistant engineer, being later transferred to the office of the engineer maintenance of way of the Buffalo and Eastern divisions in 1918, from which position he was promoted to supervisor of track, as noted above.

BRIDGE

Joseph Gaston Legrand has been appointed bridge engineer of the Western Lines of the Canadian National and Grand Trunk Pacific, with headquarters at Winnipeg, Canada.

Paul B. Spencer, assistant engineer of structures of the New York, New Haven & Hartford, has been promoted to engineer of structures, succeeding **W. H. Moore,** deceased. **Floyd J. Pitcher** succeeds Mr. Spencer as assistant engineer of structures.

T. O. Lunday, supervisor of bridges and buildings on the Central division of the Union Pacific, with headquarters at Marysville, Kan., has been transferred to the Kansas division at Kansas City, Mo., succeeding **W. A. Batey,** transferred to the Nebraska division, with office at Omaha, Neb., in place of **W. A. Conkling,** assigned to other duties. **G. T. Ray** has been appointed supervisor of bridges and buildings, with headquarters at Marysville, Kan., succeeding Mr. Lunday.

PURCHASES AND STORES

C. E. Somers has been appointed storekeeper on the Mobile & Ohio, with headquarters at Tuscaloosa, Ala., succeeding **C. L. Nash,** resigned.

OBITUARY

John G. Shillinger, chief engineer of the Rutland, died suddenly at Burlington, Vt., on November 12. Mr. Shillinger was born in 1864 and was graduated from Cornell University in 1892. He entered railway service in 1893 with the Cleveland, Cincinnati, Chicago & St. Louis, subsequently serving as assistant to the engineer of maintenance of way, supervisor of track and engineer of maintenance of way. In 1912 he was appointed chief engineer of the Rutland, which position he held at the time of his death,

M. F. Bonzano, formerly general superintendent of the Philadelphia & Reading and chief engineer of the Toledo, St. Louis & Western and the Pittsburgh & Shawmut, died October 29, at Guilford, Conn. Mr. Bonzano was born May 13, 1858, at Detroit, Mich., and was educated at Rensselaer Polytechnic Institute, Troy, N. Y. In 1878 he first entered railway service as an assistant engineer on the Pennsylvania. In 1882 he went to the Philadelphia & Reading in the same capacity and in 1885 was appointed roadmaster. In 1886 he was promoted to division engineer and in 1890 to superintendent, and in 1893 general superintendent and assistant to the vice-president. Subsequently he served in managerial positions on various small roads. In 1901 he became chief engineer of the Toledo, St. Louis & Western, which position he left in 1904 to become chief engineer of the Pittsburgh & Shawmut. Mr. Bonzano retired from active railway work in 1906.

The board of directors of the Southern Pacific adopted resolutions on November 1 approving the separation of its 160,000 acres of California oil lands and its stockholdings in the Associated Oil Company from its railroad properties.

CONSTRUCTION NEWS

The Alberta & Great Waterways Railway has awarded a contract to the Northern Construction Company, Edmonton, Alta., for the construction of a line from Lac La Biche, Alta., to the present end of the road at Mile Post 272, a distance of 159 miles. The project, which is already under way, will involve the construction of a 125-ft. wooden Howe truss span, crossing the Christina river at Mile Post 195.

The Aransas Harbor Terminal Railway will rebuild its line from Aransas Pass, Tex., to Port Aransas, a distance of 6½ miles, at a cost of $500,000. It has not yet been determined whether the work will be done by company or contract forces.

The Atchison, Topeka & Santa Fe has been authorized by the Interstate Commerce Commission to abandon the operation of a branch line extending from Henrietta, Ariz., to Poland, a distance of approximately 5.9 miles.

This road is accepting bids for a 100-ft. frame extension to its freight house at Topeka, Kan., to cost approximately $50,000. This company, which was noted in the *Railway Maintenance Engineer* for November as accepting bids for the construction of two brick lavatory buildings at Shopton, Iowa, has awarded the contract for this work to A. W. Smith, Fort Madison, Iowa.

This road also contemplates the enlargement of its Harvey house (hotel and restaurant) at San Bernardino, Cal., at an approximate cost of $90,000. The company also plans the construction of a new passenger and freight station, and an extension to its yard facilities at White Deer, Tex., to cost about $43,000, and the building of a water-treating plant at Dodge City, Kan., which will cost approximately $23,000. This company also contemplates the construction of a machine shop at San Bernardino, Cal., to cost approximately $200,000.

The Baltimore & Ohio, in co-operation with the city of Youngstown, Ohio, contemplates the elevation of Division street, Youngstown, by means of a viaduct to carry the roadway over the railroad tracks and across the Mahoning river.

The Blue Ridge Development Company is having preliminary surveys made for the construction of an electric line from Mt. Holly, N. C., to Blowing Rock, a distance of 70 miles. Some heavy grading on the mountains and one long, high bridge will be necessary.

The Canadian National is advertising for bids for the clearing, fencing, grading, culverts and bridge substructures on a 12-mile connection which it proposes to construct from Rinfret Junction, Que., to Fresniere.

The Canadian Pacific is asking for bids for the grading in connection with the construction of a branch line north from Kipawa, Que., to the Quinze river. The total length of the new line will be 68 miles, including a branch eight miles in length, to Ville Marie, on the east shore of Lake Temiskaming. The first 30 miles of the line is entirely rock country and the remainder traverses, clay, gravel and sand. There will be a few bridges, the largest being a 500-ft. steel viaduct, 50 ft. high, over the Otter river.

The Carolina Lines contemplates the construction of a new line from Charlotte, N. C., to Winston-Salem, a distance of 75 miles. There will be one important bridge, 600 ft. in length. The offices of the company are located temporarily with the Simmons Construction Company, Charlotte, N. C.

The Central of Georgia recently awarded a contract for the construction of an engine house at Columbus, Ga., to the George B. Swift Co., Chicago. The improvement, which is now under way, will cost approximately $500,000.

The Central of New Jersey has awarded a contract to the Phenix Bridge Co. for the construction of a bridge near Maurer, N. J., to replace the present structure. The new bridge will consist of a 78-ft. bascule draw span and one 65-ft. approach span and will carry two tracks.

The Chesapeake & Ohio will add 10 stalls to its engine house, install a new turntable and erect an ice plant, storeroom and office building at Clifton Forge, Va., at an approximate cost of $600,000.

The Chicago & Alton has awarded a contract to Mulville Bros., Auburn, Ill., for the grading in connection with the construction of a second track on its Chicago-Kansas City line between Manchester, Ill., and Roodhouse.

The Chicago & North Western has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 300-ton frame coaling station at West Chicago, Ill.

The Chicago Great Western, which was noted in the October issue as accepting bids for remodeling and extending its passenger station at South St. Paul, Minn., has awarded the contract for this work to Otto E. Olsen & Co., South St. Paul.

The Chicago, Rock Island & Pacific received the approval of the Interstate Commerce Commission on November 9 for a loan of $6,437,000 to aid the company in making additions and betterments other than to equipment.

The Chicago, St. Paul, Minneapolis & Omaha has awarded a contract to the George J. Grant Construction Company, St. Paul, Minn., for the construction of a freight station at Sioux Falls, S. D. Additional yard tracks at Sioux Falls are being constructed by company forces.

The Chicago Union Station Company is accepting bids for the construction of a concrete tunnel 5 ft. 6 in. by 7 ft., in section under Harrison street, Chicago. The tunnel will extend for a distance of 246 ft. between Canal street and the Chicago river.

The Dayton & Troy Electric has a freight terminal under construction at Dayton, Ohio, which will cost approximately $150,000.

The Duluth & Iron Range is constructing an overhead highway viaduct, a 75,000-gal. concrete water tank and a new track scale at Biwabik, Minn.

The Grand Trunk has a wooden freight shed and wharf under construction at Portland, Me. The new structure will be 100 ft. by 390 ft. and will cost approximately $169,000. The work is being done by the company's forces.

The Gulf Coast Lines are constructing temporary buildings at Kingsville, Tex., to replace the machine shops which were destroyed by fire, pending the completion of plans for permanent shop facilities.

The Gulf, Colorado & Santa Fe contemplates the elimination of grade crossings at Merlin and Chestnut streets, Dallas, Tex.

The Gulf, Mobile & Northern was granted a hearing before the Interstate Commerce Commission at Washington on November 22, concerning its application for a certificate authorizing the abandonment of a branch line from Ellisville Junction to Ellisville, Miss.

The Houston & Shreveport contemplates the replacement of steel bridges over the San Jacinto, Trinity Neches and Sabine rivers, at a cost of approximately $265,000. The company is also strengthening the timber trestles on its entire line at a cost of about $20,000, to permit the use of heavier motive power.

The Illinois Central has awarded contracts to Joseph E. Nelson & Sons, Chicago, for the construction of two transformer houses at East St. Louis, Ill., and one transformer house at Mounds, Ill.

The Kanawha & Michigan has applied to the Interstate Commerce Commission for authority to issue a 6 per cent ten-year promissory note for $256,000, payable to the New York Central, for a loan the proceeds of which are to be used for additions and betterments and for the rebuilding of equipment.

The Kansas, Oklahoma & Gulf contemplates the construction of a freight house at Henryetta, Okla.

The Lehigh Valley is changing the course of a creek near Waverly, N. Y., which will permit the elimination of two existing bridges. It is estimated that the work will cost approximately $100,000.

The Long Island is contemplating changes in the arrangement of its stations at Railroad avenue, Warwick street, Nostrand avenue and Flatbush avenue, Brooklyn, N. Y., at a cost of approximately $30,000. An overhead bridge and changes in the station at East New York are also contemplated, to cost approximately $45,000.

The Miami Corporation, Chicago, has awarded a contract to the Northern Construction Company, Vancouver, B. C., for the construction of five miles of logging railway from Fraser River, B. C., to Timber Limit. The Northern Construction Company will handle all work of clearing, grading and construction of bridges and trestles. The work will cost approximately $400,000.

The Missouri, Kansas & Texas has completed its grade elimination work at Dallas. The improvement, which consisted of raising the railway tracks at five street crossings, cost approximately $800,000.

The Missouri Pacific has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a power plant at Dupo, Ill., to cost approximately $15,000.

The New York Central will erect a new bridge to carry its main line over the Bessemer & Lake Erie at Osgood, Pa.

The New York Central, which was noted in last month's issue as receiving bids for the construction of a subway under its tracks at Rochester, N. Y., has awarded the contract for this work to the Walsh Construction Company, Davenport, Ia.

The New York, New Haven & Hartford has received the approval of the Interstate Commerce Commission for a loan of $9,630,000 to aid in providing equipment and additions and betterments to way and structures at a cost of approximately $13,525,000.

The Norfolk & Western is adding 16 stalls to its 24-stall engine house at West Roanoke, Va. The company is also adding 8 stalls to its engine house at Bristol, Va.

The Northern Pacific has received the approval of the Interstate Commerce Commission for a loan of $6,000,000 for the purpose of acquiring new equipment and making additions and betterments to the amount of approximately $16,000,000, of which approximately $10,000,000 is to be financed by the company. Of this loan, $3,600,000 is for equipment and betterments to way and structures. The proposed expenditures for additions and betterments to way and structures include $362,000 for widening cuts and fills, $407,454 for ballast, $1,103,400 for rail and other track material, $556,557 for bridges, trestles and culverts, $473,787 for grade crossings and crossing signals, $558,600 for additional main track, $334,750 for additional yard tracks, sidings and industrial tracks, $104,679 for signals and interlocking, $109,122 for telephone and telegraph lines, $56,585 for tunnel and subway improvements, $5,119 for section houses and other roadway buildings, $222,168 for freight and passenger stations, office buildings, etc., $105,456 for water stations and appliances, $104,038 for fuel stations and appliances, $644,121 for shop buildings, engine houses and appliances, $475,542 for shop machinery and tools, $37,327 for electric power plants, etc., $506,000 for pile drivers, cranes, etc., and $201,000 for car sheds, making a total for additions and betterments to way and structures of $6,368,905.

The Northern Pacific has applied to the Interstate Commerce Commission for a certificate authorizing it to abandon the operation of a branch line from Keystone Junction to Bayne, N. D., a distance of 1.87 miles, and a spur track, 1.75 miles, over which only five cars of grain have been shipped in five years.

The Ocean Shore has been authorized by the Railroad Commission of California to abandon service on its Southern division, extending from Swanton, Cal., to Santa Cruz, a distance of approximately 16 miles. Insufficient revenue was responsible for the abandonment of the line, which will be dismantled.

The Pere Marquette will shortly accept bids for the construction of a new station at Sarnia, Ont.

The Philadelphia & Reading has awarded a contract to Bennett & Randall, Lebanon, Pa., for the construction of a 30-ft. concrete and steel bridge over a highway near Brownstone, Pa. This contract is a portion of the company's program which calls for the elimination of five grade crossings between Swatara and Hummelstown on the Lebanon Valley branch.

The Quebec & Chibougamou will construct a 400-mile line from Quebec to Chicoutimi and thence to Lake Chibougamou. The first 120 miles of this line has already been located and contracts for grading, track laying, etc., for this section will be let shortly. The second section of 130 miles is now being surveyed. The maximum grade on the new line will be one per cent and the maximum curvature 6 deg. There will be five important steel bridges.

The Rutland has received the approval of the Interstate Commerce Commission for a loan of $61,000 to aid in making additions and betterments to way and structures at an estimated cost of approximately $89,000. The company itself is required to finance about $28,000.

The San Francisco-Oakland Terminal Railways has applied to the Railroad Commission of California for authority to abandon service and to dismantle its San Lorenzo branch line.

The St. Louis-San Francisco has awarded a contract to the William McDonald Company, St. Louis, Mo., for the construction of a frame and concrete passenger station at Wister, Okla., to cost about $36,000.

The St. Louis-San Francisco has awarded a contract to the T. S. Leake Construction Company, Chicago, for an addition to its car repair shops at Fort Scott, Kan., at a cost of about $15,000.

The Southern is building a brass foundry at its Lenoir car works, Lenoir City, Tenn., which will cost approximately $30,000. The building will be one story, 62 ft. by 120 ft., of brick and concrete construction.

The Southern Pacific will construct the following buildings at Sacramento, Cal.: A reinforced concrete oil and paint house, 65 ft. by 100 ft.; a store building of mill construction with corrugated iron sides and concrete foundation, 500 ft. long and 60 ft. wide, and a planing mill of mill construction, with corrugated iron sides and roof, to be 126 ft. wide and 360 ft. long.

The Spaulding Logging Company, whose headquarters are at Sheridan, Ore., contemplates the construction of two logging lines from the terminus of the Willamina & Grand Ronde at Bentley, Ore., into the Spaulding Company's timber holdings on either side of Bentley. Grading of the new lines will be handled by a force now engaged in completing the line of the Willamina & Grand Ronde from Willamina, Ore., to Bentley.

The Sugar Pine Railway, operating between Ralph, Cal., and Lyons Dam, a distance of approximately 15 miles, has applied to the Railroad Commission of California for permission to abandon its service.

The Tennessee Railroad has applied to the Interstate Commerce Commission for a certificate authorizing it to construct and operate a railroad up Beech Fork of New river in Campbell and Anderson counties, Tenn.

The Texas & Pacific will accept bids about November 30 for the construction of a one-story brick passenger station at Ranger, Tex., which will cost about $90,000 complete. The company has recently awarded a contract to the Missouri Valley Bridge & Iron Company for the construction of a substructure necessary for installing a 135-ft. double-track bascule bridge span over the Bayou Plaquemine at Plaquemine, La. The new bridge will replace a single-track swing span which is too old and light for further service. The contract has not yet been let for the superstructure, which is estimated to cost $235,000 complete.

The Union Pacific has been authorized by the Interstate Commerce Commission in a ruling made on November 21 to construct an extension of its lines in Scotts Bluff County, Neb., and Goshen County, Wyo., with a total length of 43.5 miles, at an estimated cost of $3,835,000, and is also authorized to retain for a period not to exceed 10 years all of the earnings derived from this extension in excess of the amount otherwise provided for in Section XV-A of the Interstate Commerce Act.

The Western Pacific has awarded a contract to the Utah Construction Company, Ogden, Utah, for the grading in connection with a new line to be built from Niles, Cal., to San Jose, a distance of 32 miles.

The Wichita Falls, Ranger & Fort Worth contemplates the construction of a roundhouse and machine shop at Ranger, Tex.

The Wichita Falls & Southern has applied to the Interstate Commerce Commission for a certificate authorizing it to construct and operate a new line from Newcastle, Tex., to Breckinridge, a distance of 44 miles.

The Zanesville & Western has applied to the Interstate Commerce Commission for authority to issue a 6 per cent 10-year promissory note for $60,000, payable to the New York Central, for a loan for additions and betterments.

IRON AND STEEL

The Baltimore & Ohio has ordered 30,000 tons of rails from the United States Steel Corporation.

The Chesapeake & Ohio has ordered 15,000 tons of rails from the United States Steel Corporation.

The Erie has ordered 20,000 tons of rails from the United States Steel Corporation.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 15,000 tons of rails from the United States Steel Corporation.

An order for 20,000,000 ft. B. M. of railway ties has been placed with a firm in British Columbia for use in Great Britain.

The Philadelphia & Reading is now building a bridge across the Susquehanna river at Harrisburg, Pa., consisting of 46 reinforced concrete arches of about 76 ft. clear span each. The approximate quantity of concrete required is 88,000 cu. yd. and the total length of the structure will be 3,507 ft.

The Pennsylvania Railroad's system of Americanizing its foreign-born employees, which has been carried on for several years, has now been extended to the wives of such employees. The Pennsylvania Railroad Mutual Aid Society will co-operate in carrying out these plans.

A charter has been issued by the Comptroller of the Currency for the Brotherhood of Locomotive Engineers' Cooperative National Bank, Cleveland, Ohio, with a capital of $1,000,000. Warren S. Stone, grand chief of the Brotherhood of Locomotive Engineers, is president; W. B. Prenter, vice-president, and cashier, W. F. Caleb, vice-president and manager.

The Union Pacific has reorganized its safety department to provide more intensive supervision. Heretofore the safety staff consisted of a general safety agent with three assistants, all of whom had concurrent jurisdiction, and three mechanical safety inspectors located in the large shops. In place of this organization there is now a general safety agent with five division safety agents and two safety shop inspectors, one division safety agent being assigned to each of the larger divisions and one agent covering two divisions of lighter traffic.

Accident statistics issued by the Interstate Commerce Commission in Bulletin No. 75, covering the first three months of 1920, show that 1,353 persons were killed and 15,297 were injured on the railroads of the United States from various causes. Of this total 412 killed and 510 injured were trespassers on the tracks and right of way. In train accidents 21 passengers, 113 employees and 10 other persons were killed, and 944 passengers, 980 employees and 37 other persons were injured. Derailments due to defects in track, bridges, switches, etc., numbered 1,436 and resulted in damage to railroad property amounting to $1,431,630, the deaths of 16 persons and injuries to 248. Derailments due to accidental obstructions or defects in track due to fires, landslides, floods, etc., caused 385 accidents, the loss of $356,530, the death of 20 persons and injuries to 788.

SUPPLY TRADE NEWS

GENERAL

The Cement Gun Company, Inc., has removed its main office from Allentown, Pa., to Cornwells, Bucks County, Pa., a suburb of Philadelphia.

The Graver Corporation, East Chicago, Ind., has established branch offices at 28 Broadway, New York City; 62 Conestoga building, Pittsburgh, Pa.; 1001 Gloyd building, Kansas City, Mo.; 220 Gwynee building, Cincinnati, Ohio; 314 Nicholas building, Toledo, Ohio, and 312 Balboa building, San Francisco, Cal.

The General Railway Devices Company, Racine, Wis., is the name of a new corporation organized to manufacture and sell the Automatic Switch Lock. The officers of this new corporation are W. H. Osborne, president; John G. Osborne, vice-president, and W. V. Osborne, secretary and treasurer.

Fairbanks, Morse & Co., Chicago, have purchased the entire business, consisting of all stock on hand, good-will and liabilities of the Luster Machine Shop & Railway Equipment Company, 917 Arch street, Philadelphia. **D. W. Dunn** has been appointed manager of this office. The entire personnel of the Luster Machinery Company has been retained, **E. J. Luster,** former president, having been appointed manager of the machine tool division of the Philadelphia branch.

The J. B. Engineering Sales Company, 60 Prospect street, Hartford, Conn., has been appointed Connecticut sales agent pf the **Conveyors Corporation of America,** formerly the American Steam Conveyor Corporation. The J. B. Engineering Sales Company is owned by **John Breslau,** who was formerly sales engineer, manager of publicity and production manager of the Terry Steam Turbine Company.

PERSONAL

A. S. Harvey has been appointed general sales manager of the United States Graphite Company, with headquarters at Saginaw, Mich.

J. L. Worley, executive assistant of the Railway Business Association, has also been elected treasurer, succeeding **Merle S. Clayton,** resigned.

J. B. French, formerly connected with T. S. Leake & Co., and more recently with Mellon-Stuart Nelson Company, has been appointed chief engineer of Joseph E. Nelson & Sons,

Prescott V. Kelly, formerly connected with the executive sales department of the Blaw-Knox Company, Pittsburgh, Pa., will have charge of the newly established Southern sales district of this company, with headquarters in the American Trust building, Birmingham, Ala.

C. O. Poor, president and general manager of the General Railway Signal Company of Canada, Ltd., Montreal, Que., has resigned to enter the employ of George W. Goethals & Co., 40 Wall street, New York. Mr. Poor's headquarters are at Rockland, Me.

Clifford F. Messinger, assistant to the vice-president of the Chain Belt Company, Milwaukee, Wis., has been promoted to general sales manager, with the same headquarters. **C. E. Stone** has been appointed assistant to the vice-president to succeed Mr. Messinger and **J. A. Monahan** has been appointed purchasing agent.

E. P. Williams, formerly with the McJunkin Advertising Agency, and later director of field work, Bureau of Market Analysis, Inc., has joined the staff of the Independent Pneumatic Tool Company, Chicago. Mr. Williams will be located in the general offices, Chicago, and will have charge of the direct by mail advertising and sales promotion department.

L. C. Wilson, general sales manager of the Chain Belt Company, Milwaukee, Wis., has been elected secretary of the Federal Malleable Company, West Allis, Wis. Mr. Wilson, after graduating from Yale University, began his business career as a salesman with Harbison-Walker Refractories Company, Pittsburgh. In 1917 he became associated with the Chain Belt Company and served as assistant to the vice-president until his appointment as sales manager.

Arthur E. Hauck, president of the **Hauck Manufacturing Company,** Brooklyn, N. Y., died at his home in that city on October 30, at the age of 41. He was born in Germany, where he learned the trade of coppersmith. At the age of 20 he came to America and in 1902 began business in Brooklyn. He was the inventor of a number of appliances for burning oil, one of which was the method of vaporizing kerosene in a torch with proportioned heat-resisting nozzle, the form of vaporization which is used to reduce carbonization to a minimum.

Peter Aagaard, superintendent of buildings on the Illinois Central, with headquarters in Chicago, has been appointed president of the T. S. Leake Construction Company, Chicago, succeeding T. S. Leake, who has retired from active participation in the business. Mr. Aagaard was born on September 9, 1869, in Denmark. He was educated in the technical schools of Denmark and later studied at Armour Institute, Chicago. Entering railway service with the Illinois Central as a carpenter in May, 1896, his entire service up to the present has been with that company. In 1899 he became a general foreman and in 1905 was promoted to supervisor. In 1912 he was promoted to superintendent of buildings, with headquarters at Chicago, the position he occupied at the time of his recent appointment.

Peter Aagaard

Henry C. King, president of the **American Mason Safety Tread Company,** Boston, Mass., died on October 28, 1920, after over 50 years of active business life. He was born in Tunbridge, Vt., in 1852. At an early age he went to Lawrence, Mass., where for several years he was merchant and manufacturer. In company with William S. Lamson, he introduced the Mason Safety Tread in America, early in the year 1895. He was treasurer of the American Safety Tread Company for 18 years, and succeeded to the presidency after the death of Mr. Lamson in 1912.

TRADE PUBLICATIONS

Preserving Wood Roof Decks.—The Barrett Company, New York, has issued two folders devoted to the preservation of wood roof decks and mine timbers by the use of carbosota. The various means of applying this preservative are discussed, including brushing, spraying and dipping and the open tank method.

Shearing Stresses in Concrete Beams.—The Truscon Steel Company, Youngstown, Ohio, has recently issued a 12-page illustrated booklet devoted to the shearing stresses in reinforced concrete beams. The value and requirements of proper beam reinforcement and design are included, as well as data from numerous tests.

Vital Features.—The Buda Company has just published a 12-page little booklet on the use and abuse of railroad motor cars. It is attractively prepared and full of vital suggestions for better service as well as hints for more economical operation. It outlines many common faults in the use of railroad motor cars which many times result in bad accidents and damage to property. It does not stop by merely calling attention to these faults but gives practical suggestions for their avoidance.